

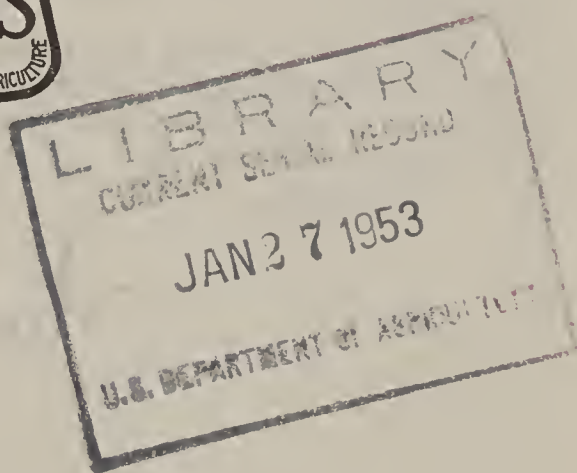
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✓ **REPORT OF THE CHIEF**
OF
THE FOREST SERVICE
1952

AMERICA'S STAKE
IN WORLD FORESTRY ✕



UNITED STATES DEPARTMENT OF AGRICULTURE

UNITED STATES DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D. C., September 15, 1952.

HON. CHARLES F. BRANNAN,
Secretary of Agriculture.

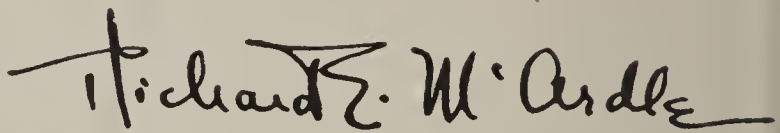
DEAR MR. SECRETARY: In addition to reviewing the work and accomplishments of the Forest Service during the past year, this report discusses some problems of world forestry. Adequate forest resources and their proper utilization are key factors in the economy and living standards of a free world. In forestry, as on many other fronts, the United States is providing technical assistance and other aids to the extent of its ability. This report therefore attempts to highlight the world forest situation, our stake in world forestry, and foreign forestry activities of this country.

My predecessor as Chief of the Forest Service, Lyle F. Watts, retired from active duty on June 30, 1952. The activities reviewed in this report occurred largely while he was still in active service, and the accomplishments reported were achieved under his direction.

As the culmination of a career of nearly 40 years in Government forestry work, Mr. Watts served more than 9 years as Chief of the Forest Service. Under his leadership the Forest Service made notable progress in the program for development of the national forests, in its research programs of forest and range management and wood utilization, and in its cooperative work with the States to aid and encourage the protection and management of forest lands. During this period the whole forest conservation movement advanced substantially.

The Nation's policy for forestry aims at making and keeping our forest lands fully productive, in the interest of national security and welfare. As the new Chief of the Forest Service, I shall continue to work for that objective.

Sincerely,

A handwritten signature in dark ink, reading "Richard E. McArdle". The signature is fluid and cursive, with a long horizontal line extending from the end of the name.

RICHARD E. MCARDLE,
Chief, Forest Service.

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AMERICA'S STAKE IN WORLD FORESTRY

A growing world population is making ever-increasing demands on the world's natural resources. As the peoples of various nations attain higher standards of living, they will call for greater quantities and varieties of material things. Their multiplying demands for the world's goods will further increase the drain on basic resources.

Important among the basic resources are those of the forests. Along with the tree-growing areas, we should also consider the range lands—the native grasslands and other areas of natural vegetation. Forests and range lands comprise a major portion of the world's total land surface. Their condition affects the welfare of millions of human beings.

Forests furnish the raw material of thousands of useful or essential commodities. They have scenic and esthetic values that are the basis of huge investments in tourist and recreational enterprises. Many forest and natural range areas furnish forage for the production of livestock and the support of wildlife. Forest and other natural vegetation areas feed the world's great rivers; they are the source of much of the world's supply of fresh water, upon which industry and agriculture—and human life itself—depend.

How the forests—not only those of our own country but those of other parts of the world—are handled, whether their productivity is maintained or improved, is therefore a matter of concern to us. Resources of the forests are among the things that contribute to the strength and security of the free world. They may help to determine whether we survive against the forces that threaten us.

THE WORLD'S TIMBER SUPPLIES

Forest and range resources, fortunately, are renewable resources. As timber is used, as forage is consumed, more can be grown from the same land—that is, if the land is not made useless by destructive exploitation and erosion.

Some 10 billion acres, about one-fourth of the world's land area, is forest land. About one-third of this forest land has only sparse and scattered stands of small scrubby trees, the kind of tree growth found in alpine locations, in desert and semiarid areas, and in arctic regions. In the United States, we call such forests noncommercial forests. They are often of great value for watershed protection, they may be useful as sources of fuel and of wood for handicraft and other local uses, but they contribute little to the world's supply of industrial wood.

This leaves about 6½ billion acres of forest land that can be classed as productive or potentially productive, capable of producing commercial crops of timber. Nearly half of the area of these productive forests remains inaccessible, including substantial portions of the great forest areas of Canada, South America, Africa, southeast Asia, and Oceania. Even in the United States many million acres of productive

forest land are still unavailable as a source of timber products because of lack of transportation facilities.

So some 3.6 billion acres, about 35 percent of the world's total forest area, is at present both productive and accessible. About one-fourth of this is in Soviet Russia and other countries behind the Iron Curtain, and so at present largely unavailable to the free world.

The large areas of productive forest now inaccessible are, of course, a potential resource that may eventually contribute substantially to the world's timber supplies. But it may be a long time before the development of many of these forests in remote and rugged parts of the earth becomes economically feasible. More timber products from the Soviet sphere also may some day enter into world trade. But Russia's own growing needs will probably limit the volume of timber products available for export. For the foreseeable future the free world must depend mainly on what timber supplies are available, and what can be grown, on its own productive and accessible forest lands.

Softwoods and hardwoods

About 70 percent of the world's forest land is in the Northern Hemisphere. In the temperate regions of the Northern Hemisphere, moreover, is found practically all of the coniferous or softwood timber. Softwoods, such as the pines, firs, and spruces, are the woods most commonly used by our principal forest industries. They provide the bulk of our construction lumber; they are the source of most pulp and paper products.

The north temperate forests also contain a variety of general-utility hardwoods—oaks, maples, gums, and other broadleaved trees. The woods from various of these hardwood species find many uses—for flooring and certain other construction needs, for cooperage, veneers, furniture, tools, implements, and many other commodities. Some of the hardwoods of the temperate regions also are being used to an increasing extent for pulp and paper.

The Southern Hemisphere contains very little softwood or temperate hardwood forest. The main forests of South America, of Africa, of southeastern Asia, and of Oceania lie almost wholly in the tropics and are composed largely of tropical hardwood species.

The tropical hardwoods that have found a place in industry and trade are mainly those possessing characteristics that make them suitable for cabinet work and specialty uses. Mahogany is a choice cabinet wood, and it also has important military uses for boat and aircraft construction. Balsa has been in demand for life rafts and preservers, for aircraft plywood, and other specialty uses requiring extreme lightness and buoyancy. Teak is one of the finest woods for ship decking and planking. Lignum vitae is used for propeller-shaft bearings.

Hundreds of other kinds of woods, growing in mixture throughout vast areas of tropical forest, have as yet no established commercial value. Their properties are largely unknown, their potential uses undetermined. Unless and until profitable markets can be found for the great variety of little-known tropical hardwoods, these abundant woods will contribute little toward meeting the world's timber requirements.

Forests and Living Standards

An abundance of wood and bountiful supplies of water (also to a large extent a forest product) are among the things that contribute to a country's industrial development and high standards of living. In contrast, destruction of forests and deterioration of watershed values have helped to create acute economic problems in many parts of the world. Wood and water scarcities are reflected in low living standards for millions of people.

A crying need in many parts of Asia, the Near East, and north Africa is for the protective influence of forests on watershed lands. Except along some of the river bottoms, the land is so denuded and eroded that agricultural use is practically impossible.

Many an American burns as much wood in his living-room fireplace during a few winter evenings as the average person in north Africa or the Near East uses for all purposes, including fuel, during a whole year. Because of wood scarcity in many of the densely populated parts of the world, especially Asia, the people must rely largely on such material as grasses, shrubs, or cattle dung for fuel.

We in the United States consume two-thirds of the free world's total yearly output of wood pulp. We use about half of all the lumber. Our per capita consumption of wood for all uses is more than three times the average of the free world, as reported by the United Nations' Food and Agriculture Organization. With fuel wood excluded, it is nearly five times the world average. In Europe and Asia, more than half of all wood consumed is burned for fuel; in South America and in Africa, more than 80 percent, whereas in the United States only about 11 percent of our wood consumption is for fuel. For industrial uses (fuel wood excluded) only one country, Canada, consumes more wood per capita than does the United States.

The World's Needs Will Increase

The chief wood-using countries of the free world—Canada, the United States, and the countries of Western Europe—now consume more than 80 percent of all the wood used. Undoubtedly they would use even more if plentiful supplies were available at moderate cost.

There is an enormous potential demand in many wood-hungry countries of Asia, Africa, and Latin America. The needs of these countries for timber products are bound to grow as populations increase, economic conditions improve, and living standards rise.

What are the possibilities of the free world meeting its future needs for wood?

In the report of the President's Materials Policy Commission last year, it was estimated that the prospective annual requirements of the free world for industrial wood some 25 years hence would be about 40 percent above the 1947-49 consumption average. But against this prospective increase in requirements, the estimated increase in the free world's annual output of industrial wood is only 4 percent, unless extraordinary measures are taken to build up forest productivity in the more advanced countries and to expand production in underdeveloped countries.

The Western European countries generally are much more advanced than other parts of the world in the application of forest management designed to maintain the forests in permanently productive condition. In the United States and Canada, such management methods are not as yet widely enough practiced to assure perpetuation of the resource at a level commensurate with probable future national requirements. In Africa and in Latin America, forest management, with a few noteworthy exceptions, is either lacking or just beginning. A high order of forest management can be found in the teak forests of Burma, Thailand, and Java and in some parts of India, Malaya, Australia, and New Zealand, but in most of Asia and Oceania the forest conditions reflect a lack of systematic care and protection.

Canada may eventually increase output

Canada, now the world's leading exporter of timber products, has large areas of unexploited forests, predominantly softwoods. But these include millions of acres of trees of small size and slow growth, in the northern part of the country. Less than two-thirds of Canada's total forest area is classed as commercially productive, and of the productive forest area about one-third is at present inaccessible.

Canada has by no means attained the maximum sustained output of forest products of which its forest lands are capable. Losses from fire, insects, and disease have been heavy, and many areas have been cut over without adequate provision for restocking. With wider application and intensification of systematic forest protection and management, it should be possible to increase the harvest of wood from the forest areas now accessible. Also, large areas now classed as inaccessible will eventually be opened up. In the long run, therefore, Canada should be able to increase her output of forest products, on a sustaining basis.

But with Canada's industrial expansion and increasing population, her own needs for timber products are growing. And so are those of other nations with which Canada may wish to maintain trade relations. The United States cannot safely look to Canada for imports of forest products greatly above present levels, particularly of saw-timber products.

Western Europe's forests

The area of the productive forests of Free Europe represents only 5 percent of the free world total, but includes nearly 30 percent of its northern softwood forest area. These European forests are almost all accessible. Many of them have a longer history of management and regulated yield than those of any other world area.

Prior to World War II, annual cutting in the forests of Western Europe was generally in approximate balance with annual growth. There was serious overcutting, however, in some of these forests during and after the war years. Although definite data are lacking, it is generally believed that regional drain still exceeds growth by a considerable margin.

Western Europe, before the war, obtained a substantial part of its forest products import requirements from the U. S. S. R. and from other Eastern European countries now behind the Iron Curtain. During and immediately following the war, these imports were almost wholly cut off. They are still far below the prewar volume.

If improvement in Western Europe's over-all economy continues, the demand for timber products may be expected to rise to or above pre-war levels. But there is little possibility that the countries of Western Europe will be able to increase very greatly the output from their own forests without suffering the consequences of prolonged over-cutting. The gap between their timber needs and actual production will probably widen, and it will be a gap that cannot be filled from Western Europe's forests alone. Generally, Europe's forests need rebuilding, rather than heavier cutting.

If, before many more years go by, there should again be a free flow of trade and the countries in the Soviet orbit should participate fully in meeting world timber demands, the European timber-supply outlook would improve materially. With one-fourth of the world's productive forest land, and nearly half of its softwood-forest area, the U. S. S. R. might again become the world's leading softwood-timber exporter. Its forests probably can be developed eventually to sustain an output two or three times greater than at present. But the timber requirements of the Soviet bloc are growing steadily, and that area may continue to consume internally a very large percentage of its current production.

Latin America's undeveloped forest resources

Latin America's total area of productive forests is about 75 percent greater than that of the United States and Canada combined. It includes vast stretches of undeveloped "jungle" in the more remote areas.

Few of the Latin-American countries have effective forest-conservation laws or adequate forestry services or schools. Forest management is in the beginning stages.

In many of the hardwood areas, only a few of the choicest species have been cut in commercial logging operations. This has reduced the supply of such choice woods as mahogany and Spanish cedar (cedro) in the most convenient locations, causing deterioration in the value of the culled stands.

Outright forest destruction more often results from cutting for fuel wood, which is estimated to comprise some 80 percent of total wood consumption in Latin America, and from a shifting or roving type of agriculture. This system of primitive farming, based on using the comparatively fertile virgin forest soils, is practiced widely in the tropics. The farmer clears a patch of forest, grows food crops for a few years, until the land wears out, then clears a new patch of forest and abandons the old clearing. Serious erosion in many places on the steeper slopes results from this "milpa" system of agriculture.

The only sizable body of natural softwood timber in Latin America is in the Parana "pine" region of southern Brazil, with a small extension into Argentina (Parana pine is not a true pine but an *Araucaria*).

In addition to the Parana pine belt in Brazil, there are softwood forests in Mexico, Central America, and Chile. None of the softwood forest areas of Latin America is large enough to permit substantial timber exports without overcutting or ignoring future domestic needs.

The vast unexploited forests of such regions as the upper Amazon and upper Orinoco contain a great variety of hardwoods, many of

which may have commercial possibilities. But, aside from pulp and paper and other products of the wood-chemical industries, there is considerable doubt as to the extent to which tropical hardwoods can be economically substituted for the northern softwoods and hardwoods that now supply the great bulk of the free world's industrial wood requirements.

Central and South Africa

The total forest area of Central and South Africa is greater than that of Latin America, but only about 40 percent of it is classed as productive. Large areas of these forests are inaccessible at the present time. A zone of tropical-rain forests exists near the equator, containing hundreds of tree species, all of them hardwoods. The mountain forests in eastern Africa and in the eastern part of the Union of South Africa are also predominantly hardwoods. North and south of the equatorial-rain forests are deciduous forests in which fewer species occur and the stands are less dense. The next zones are open tree savannahs, beyond which lie zones of shrub and thorny savannahs, and finally the deserts and steppes of the extreme northern and southwestern parts of the continent.

Great areas of Africa's original forest have been destroyed by overgrazing or by shifting cultivation, involving the annual clearing and burning of patches of forest. The process is continuing. In the past, when native populations were small, the practice of shifting cultivation probably did relatively little damage because the periods between crops were long and the forests and soils had a chance to recover. Increases in population during the past half century, resulting from improved sanitation and the virtual elimination of tribal warfare, have speeded the processes of deforestation and forest deterioration.

As in Latin America, logging in Africa has been limited to a few species of established commercial value. Most of the rain-forest species are still commercially unknown.

The region is now a small net exporter; hardwood log and lumber exports have increased since the war. But Africa itself has one of the world's lowest wood-consumption rates; its per capita consumption is only about one-half of the world average, and something like 90 percent of that is for fuel.

To raise the level of the present population's wood consumption to the world average would require a doubling of supply. Increasing population and economic development actually are causing an expanding domestic demand for wood, and there is little prospect of the region becoming a major exporter of forest products.

Timber deficit in North Africa and Near East

North Africa and the Near East are the most timber-deficient areas in the world. Forests cover only 4 percent of the region's area, and less than one-quarter of these forests are both productive and accessible. Throughout the region, ancient abuses of the land and its vegetative cover, continued and accentuated in modern times, have reduced once extensive forests to scrubby remnants. Excessive grazing by roving herds, uncontrolled cutting for fuel wood, and widespread fires have combined to make this region's forest resources poorer than those of any other. The denudation of watersheds has resulted in

uncontrolled runoff of water, floods, erosion, and inadequate water supplies.

Limited areas of mountain forest of good quality are found in portions of Iran and Turkey. Some progress has been made in improving remaining forests and in planting new ones elsewhere in the region. But only an intensive program of forest rehabilitation and soil conservation carried on for many years can bring any major betterment of the forest situation. For many years to come, any substantial increase in wood demand, such as would come with expanded economic activity and improved living standards, can be met only through increased imports from other regions.

Surpluses and deficiencies in Southeast Asia

In Southeast Asia, dense tropical rain forests comprise a large portion of the total productive forest area. Coniferous (softwood) forests, confined chiefly to the slopes of the Himalayas and parts of the Philippines, cover about 5 percent of the total area. Burma, Indo-China, Java, and Thailand are the principal suppliers of teak, one of the world's most valued hardwoods. Most of the forests of the region are made up of a great variety of species, only a few of which have present commercial value.

Exploitation of the forests throughout much of the region is difficult because of steep mountains, much swampy terrain, and torrential streams. About half of the forest area is considered accessible. While a large part has not been exploited, the most accessible forests of almost all of the countries have suffered in some degree from overcutting, shifting agriculture, repeated burning, and heavy grazing. In India and Pakistan, the pressure for cropland and for fuel wood has denuded great areas.

The region as a whole has the forest resources to meet its needs for timber without overcutting. But there is no effective way at present to draw on the surplus areas to meet the requirements of the deficit areas. Eventually, the opening up of areas now inaccessible, improvement of transportation facilities, and construction of timber-processing plants should overcome this difficulty. In all probability, however, industrial development and expansion of timber production in the region will come very gradually.

Oceania's forests

The combined productive forest area of Oceania, including Australia, New Zealand, eastern New Guinea, and the islands of the South Pacific, is about 3 percent of the free world's total. Of Oceania's productive forest area, Australia has about 40 percent and New Zealand 4 percent.

Australia's productive forest area is confined to a narrow fringe along part of the coast line. Most of it is in hardwoods, chiefly eucalyptus, of which there are several hundred species. To supplement the limited supply of indigenous softwoods, Australia has planted large areas to exotic conifers, principally Monterey pine, a tree native to California, which has been found to thrive "Down Under."

In New Zealand, about 40 percent of the forest area is now considered accessible. Most of the accessible area is in softwoods; almost half of it has been planted in exotic conifers, chiefly Monterey pine. The inaccessible forests are mostly hardwoods. Increasing demand

for the conversion of forest land to farms and sheep ranches poses a problem in land use. Although Australia and New Zealand export some specialty woods, both are currently net importers of wood products. Neither country can be expected to become an exporter of any substantial quantities of timber to other regions of the world.

About two-thirds of eastern New Guinea is covered with tropical forests, some of which contain softwoods. The opening up of these forests may eventually provide important quantities of wood for Australia's use and for export to other regions. The Fiji Islands, the Solomons, and New Caledonia have a few million acres of productive forest, largely tropical hardwoods.

Critical situation in Japan

Japan has one of the most critical forest resource situations. Although productive forests, including both hardwoods and softwoods, cover nearly 60 percent of its land area, Japan is a timber-deficient country. The heavy demand resulting from rapid industrialization and growth of population has led to severe overcutting. Drain on the softwood forests is now about three times greater than the annual growth. Reforestation has not kept pace with cutting operations, and millions of acres of cut-over land need restocking. Only the national forests, which consist mainly of hardwoods in the less accessible portions of the islands, are generally in good condition and managed according to conservation principles.

If Japan is to gain self-sufficiency in timber, drastic measures to build up the forests to a higher level of productiveness, and intensive forest management to maintain that productiveness, will be necessary. The Japanese Diet in 1951 enacted stringent forestry legislation which, if effectively carried out, should result eventually in a greatly improved forest-resource situation.

OUR TRADE IN FOREST PRODUCTS

Although the United States carries on a fairly substantial trade with foreign countries in forest products, this trade, with the exception of newsprint paper and to a much lesser extent wood pulp and softwood lumber, is not vitally important to our timber economy. Our imports of lumber and primary wood products in relation to our total consumption are small. Our exports are even smaller. With the exceptions noted and aside from comparatively small quantities of cabinet and specialty woods from the tropics, the United States is still essentially self-sufficient.

Softwood lumber, hardwood lumber, wood pulp, and newsprint paper are the four principal forest products moving in international trade. The United States is the world's largest producer of softwood lumber (53 percent of the free world total in 1949), and of hardwood lumber (44 percent of the total). The United States also leads in production of wood pulp (43 percent of the free world total). But the United States is nevertheless a net importer of all of these products. Except for hardwood lumber, it is the world's largest net importer of each. It is also the world's largest importer of newsprint.

Lumber

In 1928 the United States sold 3.2 billion board feet of lumber to other countries. In 1950 our exports had dropped to about half a billion (517 million) board feet. Twenty years ago our lumber exports were about 9 percent of our total production; in 1950 they were about 1.4 percent.

Our imports of lumber, on the other hand, never exceeded 2.0 billion board feet in any one year until 1950, when they reached an all-time high of 3.4 billion feet. This was equivalent to about 8 percent of total United States consumption.

Softwood lumber, from such species as Douglas-fir, spruce, pine, and hemlock, amounts to about 85 percent of our total lumber imports. It includes lumber for construction, for boxing and crating, and other general purposes. Nearly all of it comes from Canada. Our hardwood lumber imports include general-utility woods such as beech, birch, and maple from Canada, and cabinet and specialty woods from the tropics.

Our exports of softwood lumber greatly exceed those of hardwood. Douglas-fir and southern pine outrank all other kinds of softwood. Oak is the principal hardwood exported. American forests contain a number of other hardwoods with properties that make them especially suitable for certain exacting uses. Examples are hickory for tool handles, picker sticks (for looms), and shunt poles (used by the British railroads); white ash for tool handles, boat oars, and athletic equipment; dogwood and persimmon for shuttles; black walnut for gunstocks; and yellow birch for aircraft veneer. These woods have been in demand by foreign countries, but the domestic supply of a number of these specialty hardwoods is becoming increasingly limited.

Our ability to continue substantial imports of softwood lumber probably will depend largely on Canada's future production, the demands of her other customers, and her own growing needs. In the long run, Canada offers less promise as a lumber exporter than as a supplier of pulp and paper. Her area of forest land suitable for saw-timber production is relatively small, compared with that of the United States. Much of Canada's forest area is too far north to produce trees of the larger sizes.

Pulp and paper

In 1950 the United States imported 1.8 million cords of pulpwood from Canada. This was 7.8 percent of our total pulpwood consumption.

United States imports of wood pulp (2.4 million tons) amounted to 14 percent of total domestic consumption. Canada was the source of about 70 percent of our pulp imports; Sweden, Finland, and Norway supplied most of the remainder.

Our imports of paper and paperboard amounted to about 5 million tons in 1950. Practically all of it was newsprint. For newsprint paper we depend upon importing more than 80 percent of our total supply. Most of it comes from Canada.

Our yearly exports of pulpwood and wood pulp and of paper and paperboard amount to only a small fraction of our imports.

Other forest products

Mahogany, balsa, and teak are among the most important tropical woods imported by the United States. Other specialty woods, imported on a small scale, include lignum vitae, Australian ironbark (used for ship-prow sheathing), and boxwood (for scales and rulers).

We import some softwood logs from Canada (about 156 million board feet in 1950) to be made into lumber or veneer in this country. For the woods used to produce fine cabinet veneers, log imports exceed sawn-lumber imports. The principal sources are the Central American countries, West Africa, and the Philippines.

In the past few years we have imported an average of about 300,000 poles a year, or approximately 4 percent of domestic production. Other imports include several million Christmas trees shipped into this country each year from Canada.

A number of other primary wood products, such as hewn railroad ties, pit props, shingle bolts, and various other kinds of bolts, move in trade with other countries, but as a rule the quantities involved are very small.

Canada world's greatest supplier

The Dominion of Canada not only supplies the bulk of United States imports of forest products, but it is the leading source of timber-products imports for the rest of the free world. In newsprint paper, Canada accounts for 63 percent of the free world's production and 80 percent of its exports. It is also the largest exporter of softwood lumber and wood pulp. In hardwood-lumber exports, Canada ranks second.

Free Europe is a net importer of softwood and hardwood lumber, but it is a small net exporter of wood pulp and newsprint paper. Formerly, Western Europe obtained substantial quantities of forest products from the U. S. S. R. and other countries now behind the iron curtain. When this flow was greatly reduced in the years following World War II, the timber-deficit countries of Western Europe turned to North America as a source of forest products, especially softwood lumber. Dollar shortages, however, limited their purchases. The resultant shortage of wood has been one of the factors hampering postwar reconstruction in Europe. Although timber exports from the Soviet bloc to free Europe have been on the increase since 1948, they are still much below prewar levels.

In the pattern of international trade, then, Canada is the world's great source of forest-products exports. Free Europe's output is largely absorbed in meeting its own requirements. The rest of the free world, including the United States, is largely on a net importing basis for forest products, except for some of the tropical countries which have small export balances in hardwood lumber.

FREE WORLD OPPORTUNITIES AND NEEDS

The foregoing review of the more important aspects of the free world's forest situation and trade in forest products points to the need for greater efforts to build up the productivity and annual wood output of forest lands to meet increasingly greater future requirements for raw wood material. Especially urgent is the need to enlarge the free world's softwood forest growing stocks—to provide larger quanti-

ties of such general-utility products as construction lumber and plywood, boxing and crating material, and pulpwood and pit props.

The free world contains 73 percent of the entire world's productive forest area. These forest lands are potentially capable of supplying its total wood requirements. One of the things most needed to improve the future supply situation for timber products is better forest management on forest land now used for timber production purposes. Another is the reforestation of understocked and deforested lands and the afforestation of wastelands adapted to growing tree crops. Still another is the opening up of undeveloped resources and the expansion of timber operations in industrially underdeveloped countries.

Opportunities for increasing the world's supply of timber products lie in the tropical forests of Latin America, Africa, Southeast Asia, and the western Pacific. But any increases in timber output in these areas will be almost entirely of hardwoods, most of them unlike the hardwoods of the temperate forests, and many of them without present commercial uses.

Many obstacles must be surmounted if the countries of the tropical regions are to increase the output of timber products from their hardwood forests. Remoteness and jungle conditions mean problems of health and sanitation for working crews, and high transportation costs in moving the material to markets. And there are at present adequate market outlets for only a few choice species. Unstable governments in some of the countries in the tropical forest regions, and frequently inadequate or uncertain administration of public laws and regulations, add to the difficulties.

Before forest resource development in the more remote tropical areas can be undertaken on a large scale, extensive forest surveys and cruises will be required. A great deal of research will be needed, not only to determine the properties and potential uses of many tropical woods, but to find the best methods of harvesting and transporting the products of these forests and of managing the forests to assure their regeneration and the maintenance of adequate growing stocks for the future.

The Need for Improving Range Lands

There are opportunities, too, in many parts of the world to increase the productivity of the range lands. Range lands, wild grasslands, native forage-producing lands occupy more than half the earth's entire surface. These include grassland areas that are too steep, rough, or rocky, or too dry to be used for cultivated crops. They include open forests and savannas with scattered tree growth, where much grazable vegetation also occurs. They include large areas in desert shrub, mountain meadows, and alpine grasslands near or above timber line. They include the tundras of the far north.

Millions of people, nomadic herdsmen and others, gain a livelihood from these lands. Many more millions depend for their living on processing, transporting, or selling the products of the range. From these lands comes a substantial portion of the world's supply of meat, wool, hides, milk, and other animal products. In the United States, approximately half the beef cattle and 75 percent of the sheep get a considerable part of their feed requirements from the more than 950

million acres of natural range lands, which constitute nearly 50 percent of the country's total land surface.

Many of the world's range lands have been long and sorely abused and neglected. Centuries of heavy grazing have killed off the vegetation over large areas, laying bare the soil surface to wind and water erosion that has carried away the fertility of the land. In other places, continued heavy grazing has caused the better forage plants to give way to unpalatable plants. Vast areas of range land are now dominated by vegetation that is of little or no value for grazing. Lack of protective soil cover, resulting from excessive grazing, has caused desert conditions in some areas that otherwise would not be desert.

Only in a few countries—the United States, some of the nations of Western Europe, Australia, New Zealand, and a few others—has attention been given to the management of native grasslands. And in most of these countries, including the United States, positive efforts to improve run-down range have been applied to only a portion of the lands needing it.

Yet the possibilities for increasing the productivity and usefulness of the world's range lands are enormous. With careful management and wise use, productive range can be kept in good condition, and deteriorated range can be improved. Within recent years, range management has been developed as a science, with scientific principles evolved for the handling of range land and the management of livestock grazing on native forage.

In many parts of the world, the grasslands offer the greatest possibilities for increased production of food. Improvement in their productivity could mean raising dietary levels for hundreds of millions of people for whom meat and milk are now rare items. It could help greatly toward meeting the food-production problems that will come with the pressure of an ever-increasing world population.

In any broad effort or program aimed at expanding the world's production and improving the living standards of its peoples, attention should be given to the conservation and wise use of range lands. These lands have potentialities for much greater production, and so for much greater contribution to human welfare.

COOPERATION WITH OTHER NATIONS

Many of the countries with underdeveloped forest or range resources need technical and economic aid from other countries. Such aids can benefit both the people receiving it and those supplying it. Standards of living can be raised in the industrially underdeveloped countries, and increased exports can be provided for other free world areas dependent in part on imports.

The present shortage of technically trained persons in the underdeveloped countries prompts them to turn to other countries for assistance. But in the longer view it will be preferable for the underdeveloped countries to train competent technicians from among their own people to supervise the development of their own resources.

Economic and forest-resource surveys will be needed in the undeveloped forest regions, to guide the formulation of plans for orderly development. Forestry schools and experiment stations will also be

needed. Competent and efficient public forestry services should be built up.

The United States can give assistance in all these things. We can continue to offer training to foreign students in American forestry schools and through other agencies, both public and private. We can help other countries develop their own forestry training facilities. We can also cooperate in experimental projects, and in the establishment of experiment stations and forest-products laboratories.

We have already been doing quite a bit in the way of cooperation with other nations along these lines. We should do much more.

A World Forestry Movement

In 1945, an international Food and Agriculture Organization was formed as a specialized branch of the United Nations. Within FAO, a Forestry Division was set up to serve as a world clearing house of information, to provide a center of international forestry activities, and to help governments coordinate their efforts in order that the products of the world's forests may satisfy the world's needs.

The Forestry Division, with Marcel Leloup of France as its first Director, had its headquarters in Washington, D. C., until 1951, when it moved with other divisions of FAO to Rome, Italy. Regional forestry offices have been established in Geneva, Switzerland; Rio de Janeiro, Brazil; and Bangkok, Thailand.

In the few years since it was established, this international forestry organization already has taken significant action in a number of ways to promote the sound management of forests throughout the world. It has brought foresters from various countries together for profitable exchange of information and discussion of problems. It has assumed the task of gathering world statistics on forests and international trade in forest products. (FAO statistics are the basis of much of the information on world forest resources in this report.)

In its program of technical assistance, the Forestry Division of FAO has sent technical experts, individually or in teams, to help many member countries work out practical methods for improving the management of their forest resources, and for developing their forest industries.

Principles of forest policy

At the regular session of the FAO Conference in Rome, in December 1951, FAO adopted a statement of principles of forest policy to be recommended to all member nations. The recommendation would have each country base its activities in forest management and utilization on a national forestry policy founded on these fundamental principles.

This statement of principles declared that the forest is a factor of prime importance in the economic, social, and physical balance of the world, and that it is essential that each country should formulate a sound forest policy in seeking to perpetuate for the greatest number of its people the maximum benefits from the protective, productive, and accessory values of its forests. As the basis of a sound forest policy, the statement recommended:

That each country should determine and set aside areas to be dedicated for forests, in accord with the country's economic and social pol-

icy, and taking into account the close interdependence of all forms of land use.

That each country should apply the best practicable techniques, including (1) protection for the forest against damage or destruction by man or by natural enemies such as fire, insects, and tree diseases; (2) organization of production to obtain a sustained yield, taking into account the multiple services of protection, recreation, wildlife habitat, etc., that the forest may be called upon to render; and (3) encouragement of economic and rational methods of forest exploitation and of conversion and utilization of forest products for a maximum volume and variety of commodities.

That research should be organized and expanded looking to increased knowledge of all aspects of forest resources, forestry, and the utilization of forest products; and application of research results should be encouraged.

That public consciousness of forest values should be developed by all means possible.

Few countries have adopted such a comprehensive policy. Even the United States, in which the conservation movement has made notable progress during the past half century, falls short in some respects.

American Participation

From the beginning, the United States has cooperated with FAO in its forestry program. American interest in international cooperation in forestry, indeed, goes back many years before the establishment of FAO. As early as 1909, the United States called a North American Conservation Conference. In that same year, the President recommended in a message to Congress that this country invite other nations to a world-wide conference on natural resources, as one of the ways of working for a permanent peace. Although this early proposal never was acted upon, the United States, four decades later, did serve as host to an Inter-American Conference on the Conservation of Renewable Natural Resources (1948), and to the United Nations Scientific Conference on the Conservation and Utilization of Resources (1949).

For many years, American foresters have participated in the International Union of Forest Research Organizations, and in the International Association of Wood Anatomists. An American delegation attended the First World Forestry Congress, held in Rome in 1926 under sponsorship of the International Institute of Agriculture, a part of the League of Nations. Also the Second World Forestry Congress at Budapest in 1936. An American forester was a copresident of the Third World Forestry Congress, held in Helsinki, Finland, in 1949. The official United States delegation to this meeting included representatives of governmental, industrial, and educational agencies.

Each of these meetings has helped to further world forestry. Their recommendations have resulted in a number of actions looking to standardization of procedures in trade, international cooperation in research, and the advancement of technical education in forestry. The meetings provided the stimulus that comes from the direct interchange of ideas and sharing of problems. They afforded opportunities for public and private foresters and forest-products specialists, industrial engineers, forestry educators, and scientists working in related

fields throughout the world to meet and discuss technical matters and problems of mutual interest. It is to be hoped, too, that they have contributed, in some measure at least, to better teamwork among nations. Forestry can be one of the interests that works for international friendship and cooperation.

American foresters had a prominent part in bringing forestry into FAO's program. The late Henry S. Graves, dean emeritus of Yale University's school of forestry, was chairman of the Technical Committee on Forestry and Primary Forest Products, appointed to recommend ways and means for including forestry in the work of the United Nations. This committee, composed of representatives of ten nations, defined objectives and suggested the structure of a permanent international forestry organization. When the Forestry Division of FAO was set up, Lyle F. Watts, then Chief of the United States Forest Service, served as chairman of its standing advisory committee. Several American foresters, including former members of the Forest Service, have served or are now serving on FAO's headquarters staff, or have joined its technical-assistance missions to member countries.

Technical assistance

The Forest Service also has furnished specialists for technical-aid missions to a number of countries, at the direct request of each country to the United States Government.

Forest Service specialists have conducted or participated in forest resource studies, in cooperation with local authorities, in Chile, Ecuador, Costa Rica, and Panama. The Forest Service made available several technical employees to assist in organizing the forestry phases of the military occupations in Japan and Korea; and since the end of the occupation in Japan, American foresters, including members of the Forest Service, have continued to aid the Japanese Government in the development of its forestry program. American foresters also have assisted occupation authorities in the Ryukyus, and in the American zone of Germany. During the past year, a member of the Forest Service went to Venezuela, at the request of that country, to advise in the organization of the government forestry service.

In connection with its Marshall Plan activities, the Economic Cooperation Administration gave assistance to a number of European countries in their efforts to rehabilitate their forests and wood-using industries and to improve forest-management methods and operating procedures in wood production and processing.

In the "Point IV" program of technical assistance to industrially underdeveloped areas, numerous projects have required the services of American forestry specialists abroad. The Forest Service has cooperated with the Mutual Security Agency and the Technical Cooperation Administration (through the Office of Foreign Agricultural Relations in the Department of Agriculture) in recruiting foresters, forest-products specialists, range-management experts, and technicians in related fields in response to requests for technical assistance from various countries in Latin America, Southeast Asia and the Pacific, Africa, and the Near East. The Forest Service has likewise cooperated with FAO in finding suitably trained American foresters to help man its technical-assistance projects in the member countries of that organization.

The Point IV program also includes study and training in the United States by representatives of other countries. In 1950, a group of more than 50 persons from European nations visited this country to study the American lumber, plywood and wallboard industries, and American forest-management, transportation, and sawmill techniques. Another group of 40 from tropical countries came to this country for similar studies. Last year, a group of Turkish foresters, sent by their government, were completing 2 years of study in the United States, both with the Forest Service and at American forestry schools. During the past few years, the Forest Service, forest industries, forestry schools, and other agencies have cooperated in providing special training for representatives sent from Germany, Austria, Italy, Japan, and Korea, and from a number of other countries of Europe, Latin America, and Asia.

The largest group of visitors last year included some 40 foreign nationals, representing 23 countries, who came for a 6-weeks tour of the United States to study American forest-fire-control methods and techniques. The tour was sponsored jointly by the Economic Cooperation Administration and the FAO. Forest industries, State forestry departments, and other agencies cooperated with the Forest Service in arranging and conducting the study tour, demonstrations, and training course.

These numerous foreign assignments for American foresters and the training given foreign visitors to the United States are aimed at helping the forestry programs of other countries. But the Forest Service feels that the exchange of information and the development of better understanding that results from such international cooperation are of distinct benefit to forestry in our own country.

Tropical forestry research

Research by the Forest Service in the American tropics, begun in 1939, has been centered in the Tropical Forest Experiment Station at Rio Piedras, Puerto Rico. This Station has served as a center for the exchange of forest research information among the Latin-American countries, and also to some extent for the training of forestry students from Latin America.

The research program of the Tropical Station is directed toward the discovery of practical methods of increasing forest land productivity and the utility and service life of wood in the tropics. The Caribbean National Forest, which the Forest Service also administers in Puerto Rico, serves as a proving ground and demonstration of advances in tropical forest management.

Most of the investigations have been carried out within Puerto Rico, but the forests and sites of this island are representative of many in other parts of the West Indies and the Atlantic slope of Mexico, Central America, and northern South America. Some 1,600 individual tests and investigations have been undertaken. These concern tree propagation, reforestation, improvement of existing forests, tree growth rates, stand increment and yields in different products, and the durability of wood in contact with the ground, with and without the use of preservatives.

The results of these studies include the development of satisfactory propagation techniques for more than 100 tree species, the determination of satisfactory species-site relationships for more than 60 species,

a classification of sites for use throughout the island in the selection of trees for reforestation, data on the growth rate of some 200 tree species, a satisfactory technique for the improvement of secondary forests, information as to the specific gravity and related physical and mechanical properties of more than 100 local woods, and data as to the durability of 75 species used as fence posts.

The foreign program of the Station has included active participation in international conferences for the solution of regional forestry problems. The Caribbean Forester, a quarterly, trilingual, technical journal published by the Station, has carried articles from or concerning 30 different countries. A Spanish-English glossary of forestry terminology is about half completed.

The training program of the Station, begun only recently, is steadily growing in importance. Ten foreign students have received intensive forestry training of a practical nature for periods of up to 6 months at the Station. Full use has been made of a number of favorable circumstances in Puerto Rico. The results of 30 years of administration of public forests in the commonwealth, including the application of a multiple land-use policy and the establishment of thousands of acres of plantations, are shown. The forestry extension program here, directed toward the encouragement of farm forestry, is now 20 years old. Twelve years of forest research is providing an increasingly reliable background for forestry practice. The facilities of the University of Puerto Rico, the College of Agriculture and Mechanic Arts, and those of two Agricultural Experiment Stations are available to students, as are a number of agencies working in fields allied to forestry, such as soil and water conservation and hydroelectric power development. The work in Puerto Rico shows the forest policies of the United States applied in a tropical, Spanish-speaking environment familiar to the students.

Movement Needs Our Support

Led by forward-looking programs of the United Nations Food and Agriculture Organization and the progressive efforts of many of the member nations, the world forest conservation movement is gaining new impetus. It is still in its pioneer stages; the vast bulk of the world's forests have yet to feel the touch of forest management.

This world movement can have far-reaching effects. It can alleviate the developing world-wide shortage of timber products. It can help tame floods. It can make waste lands productive again. It can lead to rehabilitation and increased productivity of range lands and so help to improve the lot of millions of people now existing on substandard diets. It can help toward sounder economies and improved living standards for the nations of the world.

The world forest and range conservation movement needs our strong, continued support. It is to our own self-interest that we do what we can to help bring about good forest and range management the world over. It has become the responsibility of the United States to take a leading part in the defense of free people and free institutions against the forces of totalitarian aggression. The success of the free world will depend in large measure upon its ability to produce and keep on producing. It is essential that the free world be made and be kept strong in basic resources to sustain that production.

The United States, of course, should be in the forefront among nations in developing and properly using its own forest and range resources. We still have a long way to go. In terms of application on the ground, forest conservation is much further advanced in certain other countries than here.

We do have many competent technicians in forest and range management, both in public and private employment. And we have worked out many effective techniques. Through research and experience we are constantly developing better management practices. The big jobs still to be done are to get these improved practices much more widely applied in our own country, and to assist in the development and wise management of forest and range resources in other countries seeking our aid.

THE NATIONAL FORESTS

Record Receipts

The national forests took in a record amount of money last year. The returns exceeded appropriations for protection and development of the national forests by some \$10,000,000. They nearly equaled the expenditures for all purposes, including the payments of 25 percent of gross receipts to the States.

The bulk of the receipts came from the sale of timber. The record high total reflects the current heavy demand for timber and the big increase in stumpage prices that has occurred during the past few years. Grazing fees and the leasing of land for resorts, summer home sites, and other special uses also brought in revenue.

Some individual national forests with heavy stands of commercial timber bring in very big cash returns. Others that contain large areas of noncommercial forest land produce little cash revenue, although their services in watershed protection or recreation may be of high value. A number of the national forests also include areas of recently acquired cut-over and burned-over forest land that now bring in little cash income, but as new timber growth is built up these forests will yield larger returns.

Administration of the national forests requires substantial expenditures for handling recreational use of the forests, for protecting large areas of watershed land that does not produce commercial timber, and for other activities that bring in little or no monetary returns. Expenditure of public funds for such purposes is justified by the great importance to the American people of such things as the forests' scenic values, opportunities for health-giving outdoor recreation, the reduction of flood danger, and the safeguarding of water supplies for domestic, industrial, and agricultural use. It is gratifying when the annual cash returns are large enough to cover current expenditures for all these non-revenue-producing activities, as they did last year.

But the attainment of high income is not the primary purpose of national-forest management, nor is it the principal measure of successful management. Success in the management of the national forests will be measured by the extent to which their yield of resources and services can be developed and permanently sustained, and by the degree to which the national forests can be made to contribute to the stability and sound development of communities and to the Nation's security and welfare.

States and counties share in receipts

For the most part, national-forest receipts cannot be applied directly to meet expenses nor can they be "plowed back" for the further development of the forests. All receipts, with certain relatively minor exceptions, are deposited in the United States Treasury. The funds for administration and development of the national forests are appropriated by Congress. Congress has authorized, however, that 10 percent of receipts be made available for expenditures on forest roads and trails in the States of origin.

Each year, too, under present law, an amount equal to 25 percent of the receipts is paid by the Federal Government to the States for distribution to counties containing national-forest lands. These payments are for local road and school funds. They vary widely among different counties. Some counties whose local national forests are doing a big timber sale business get very handsome yearly payments. For others, where denuded lands have been acquired for national-forest purposes, the yearly payments will be almost negligible during the period of forest restoration. A number of counties have national forests that perform vitally important watershed protection services but yield little monetary income.

Since the Federal lands are not subject to State or county taxation, the Forest Service believes that the national forests should contribute a fair share toward the maintenance of local governments.

Timber Management

The harvest of mature timber from the national forests, and cuttings made to improve conditions for growth in overcrowded stands, yielded approximately the same volume of forest products as during the previous year, 4,419 million board feet as compared to 4,688 million board feet in fiscal year 1951. Receipts from the sale of timber exceeded \$60,000,000, an all-time record high for annual value of timber cut.

A total of 23,968 timber sales was made during the year. Of these, 19,533 were small sales amounting to less than \$1,000 each; 747 were between \$1,000 and \$5,000; and 868 were over \$5,000. There were 2,820 sales of miscellaneous forest products.

Progress report on Shelton

Five years' operation of the Shelton cooperative sustained yield unit in the State of Washington has produced some substantial results. The unit, established in December 1946, committed to unified management 159,000 acres of Simpson Logging Co. lands and 111,000 acres of national-forest lands for 100 years. Allowable cut for the first 10 years was fixed at 100 million feet annually. The actual cut during the 5-year period 1946-51 was 474,215,000 board feet, of which 185,000,000 feet was cut from national-forest lands. This national-forest timber was valued at \$2,402,547, or an average of \$13 per thousand board feet, compared with the average value of \$8.43 per thousand feet of some 700 million feet cut on other parts of the Olympic National Forest during the same period. Differences in species and quality of timber, and in development and logging costs affect comparisons of this sort, but it is evident that stumpage returns in the cooperative unit compare favorably with those outside the unit.

Roads and bridges built by the company during the period cost \$1,881,000. Some 3,000 acres of national-forest land and 5,000 acres of company lands in the unit were planted during the period. Under the terms of the cooperative agreement, management of the private and public lands is coordinated on the ground through joint planning by representatives of the company and of the Forest Service. Cooperative relations have been most gratifying.

The company manufactured the timber cut in the unit in Shelton and McCleary, through the operation of two sawmills, two plywood plants, a softboard plant and a door plant. Logging and manufacturing furnished employment to nearly 2,000 persons. In Shelton and McCleary, as well as in other communities near the unit, there has been substantial growth in population, home ownership, bank deposits, stores, schools, and other community facilities during the 5 years since the unit was established. Thus, public and private timber are being harvested under a coordinated sustained-yield program with attendant permanent community benefits.

Insect control

The 1950 and 1951 control programs against the tree-killing Engelmann spruce bark beetle in Colorado, combined with natural factors such as woodpeckers, insect predators, and weather conditions, greatly reduced the beetle population in 1952. The control program necessary in 1952 therefore was much smaller than those of the two preceding years.

It is expected that only mop-up treatment will be necessary in 1953. The foresters and entomologists working on the project were highly optimistic that the beetle epidemic in Colorado has been successfully controlled.

In the northern Rocky Mountain section of western Montana and northern Idaho, however, an outbreak of the Engelmann spruce beetle started in the summer of 1952 that threatens to become one of the worst insect epidemics ever to occur in this region. The epidemic is the result of violent windstorms in 1949 which knocked down tremendous numbers of trees and so provided ideal conditions for a build-up of the beetles.

In the fight against the spruce budworm epidemic in the Pacific Northwest, the State of Oregon and the Forest Service cooperated in the aerial spraying of 665,000 acres during the early summer of 1952. This was the fourth year of this cooperative undertaking, in which a total of more than 2 million acres of budworm-infested forest has been successfully treated. In Montana, however, a budworm infestation has developed to the point where aerial spray control will be needed.

Big salvage job

Salvaging blow-down timber was a major activity in western Oregon, western Montana, and northern Idaho last year. Since 1949 each of these areas has suffered from one or more storms of hurricane force which felled "clear-cut" patches and individual trees over wide areas. Probably at least 8 billion board feet of timber was blown down in Oregon, and more than half a billion feet in Idaho and Montana. Much of the flattened timber was in rough topography many miles from roads.

Most of the damage occurred in older stands particularly susceptible to insect epidemics that might build up in the windfalls. Salvage operations were started, therefore, as soon as possible in the heaviest concentrations of dead and dying trees, in the hope that insect depredations could be prevented from multiplying the loss that had already occurred from blow-down.

National-forest timber sale and access road programs were promptly reoriented to meet the emergency. Excellent cooperation was obtained from local landowners and timber purchasers. Several private operators completely changed their logging plans in order to salvage blow-down timber on national forest as well as on their own lands.

With the outbreak in 1952 of the Engelmann spruce beetle in Idaho and Montana, and of the Douglas-fir beetle in Oregon, salvage efforts were increased. They will include the harvesting of as much of the infested timber as possible.

Growth increasing in eastern forests

The national forests east of the Great Plains contain 20 million acres of commercial forest land, nearly all of which was acquired by the Government through purchase. Most of the timber stands had been badly depleted by cutting and fire. The recovery brought about by fire protection, planting, and forest management is most gratifying. The key to rehabilitation is to increase the forest capital by cutting each year less timber than grows, so that future yields will be much greater and of higher quality.

In 1952 the total saw timber and pulpwood cut from these eastern forests was equal to about 40 board feet per acre of commercial forest land. This is estimated to be less than half the current annual growth on these lands. The remainder is being added to growing stock, or forest capital. Over a period of years, during which additional improvement and salvage cuts will be made, more fully stocked forest stands will result. The annual cut can be increased during this period, so that these public forests will yield increasingly greater returns.

New timber growth in the national forests of the Lake States has already made it possible to raise the allowable annual cut from 300,000,000 feet to 425,000,000 feet. Within 10 years it should be possible to make a further increase. Pulpwood now represents about 75 per cent of the volume cut annually, and the large Lake States pulp and paper industry, using nearly 3 million cords a year, is looking to the national forests for a large part of its raw material. The pulpwood industry uses small material, which means that forest management can be more intensive than where only sawlogs are marketable.

The Davy Crockett National Forest in Texas provides a good example of progress in intensive management. This area of about 160,000 acres was purchased as cut-over land 15 to 20 years ago. In 1937 the area had an estimated 319 million board feet of pine saw timber, plus an undetermined amount of pine pulpwood. By last year the volume of pine saw timber had more than doubled, and the total pine volume, saw timber, and pulpwood, had increased to an estimated 1.3 billion board feet, even though some 168 million board feet had been cut from the area. Only a part of the annual growth will be cut until the timber stand reaches about 2 billion board feet. At

current growth rates this goal will be reached in another 15 years. Then the area should yield something like 100 million board feet of pine timber—sawlogs and pulpwood—a year, or over 600 board feet per acre per year, continuously.

Roads key to full harvest in western forests

Commercial timber areas in the western national forests include a substantial acreage of mature and overmature timber. Losses in such timber stands are high as a result of fires, insects, and diseases—overmature timber is especially vulnerable to insect and disease attacks. Good timber management calls for cutting in these stands to reduce the susceptibility to loss and to place them in condition for good growth to help meet future requirements for timber products.

Approximately 1.4 billion board feet of timber was cut from the western national forests in 1940. By fiscal year 1952 the cut had been increased to 3.5 billion board feet. To increase the yearly cut to the sustained yield capacity of each working circle, or even to maintain it at the present level, timber access roads will have to be constructed into areas now inaccessible. A permanent system of timber access roads will help in reducing losses from fires, insects, and diseases, by making it possible to harvest overmature timber before it is attacked or killed, and by providing accessibility to conduct direct pest-control operations.

Of the total mileage of road construction and reconstruction that the Forest Service estimates will be needed to maintain the present rate of cut and to increase the annual cut on all national forests to the currently obtainable sustained yield capacity of 6.6 billion board feet a year, about 80 percent is needed on the western national forests. Roads in the western forests are therefore the key to attaining full timber harvest and net growth in the national forests. Millions of acres of wild forest land must await an adequate road system before they will return their full worth in forest products and in growing capacity. As these acres now stand, undeveloped, a large part of their growing capacity is continually being wasted by fire, insects, diseases, and wind.

The costs of timber access roads are more than returned by the timber made accessible and cut. Larger timber operators usually have the equipment and means to build roads needed in connection with their operations, but if the national forests are to continue to supply timber to the smaller timber operators dependent upon national-forest timber for their supplies, the Government will have to build some of the access roads. Access road construction in the rugged country of the West is often a formidable job, requiring equipment, engineering skills, and means beyond those possessed by smaller operators.

Reforestation

During fiscal year 1952, 49,636 acres of national-forest land were planted or seeded to trees. This brings the total of successful national-forest tree plantings to 1,445,666 acres. Most of last year's planting—some 28,000 acres—took place west of the Great Plains. Approximately 21,000 acres were planted in the eastern national forests.

Of the total area planted and seeded, some 60 percent was accomplished on recently cut-over areas with funds deposited by purchasers of timber, under terms of the Knutson-Vandenberg Act of 1930, for reforestation or stand improvement of timber sale areas. Slightly less than 20,000 acres were planted in other areas, with funds appropriated by Congress. The total acreage planted covered only a small fraction of the 4 million acres in need of reforestation.

On some cut-over and burned-over areas where seed trees are still present, satisfactory natural regeneration can be obtained by site preparation. This may involve scarification of the soil surface, or poisoning seed-eating rodents, or both, just prior to seed fall. Some 42,000 acres were so treated during the year.

Timber stand improvement

Funds collected in connection with timber sales, under authority of the Knutson-Vandenberg Act, provide the means for establishing natural tree growth and protecting it during its early stages, and for doing some work to improve the future stand of timber on timber sale areas. Such work often results in eliminating the need for costly planting and seeding of cut-over areas. It brings increased growth of immature timber of desirable species. In addition, growth of higher quality is being obtained. During the past fiscal year the following work was done under this act:

	<i>Aeres</i>
Plantation release.....	6, 753
Natural stand release, weeding and thinning.....	258, 370
Pruning.....	85, 689
Animal control (hogs, etc.).....	74, 481
Rodent control.....	1, 830
Disease control.....	37, 823
Other.....	10, 239

Additional timber stand improvement work was accomplished in stands of promising young growth, not associated with current timber sales, as follows:

	<i>Aeres</i>
Plantation release.....	20, 096
Natural stand release, weeding and thinning.....	20, 094
Pruning.....	272
Animal control (hogs).....	102, 401
Rodent control.....	16, 652
Disease control.....	58, 302
Other.....	22, 202

Range Management

The Forest Service issued 19,708 pay permits to livestock operators for the grazing of 1,088,215 cattle and 3,012,712 sheep on national-forest ranges in 1951. In addition 4,368 owners grazed 47,283 cattle, 5,353 sheep, and 1,210 swine under regulations allowing free grazing permits to local settlers.

Except in parts of the Southwest where cattle grazing on the ranges is predominantly year-long, most national-forest ranges are used seasonally, during the spring, summer, and fall months. For cattle the average grazing season is about 5 months; for sheep, about 3 months. In 1951 cattle grazed national-forest range for a total of 5,598,880 months; sheep for a total of 7,668,151 months.

The grazing fees on the national forests are adjusted each year in accordance with market prices of livestock for the preceding year. Because of the high market prices received by producers in 1951 for beef cattle and lambs, the grazing fees reached an all-time high in 1952, averaging 64 cents for cattle and 15.25 cents for sheep per head per month. Total grazing receipts for the fiscal year 1952 amounted to \$5,022,654.

Range improvements

For fiscal year 1952 Congress appropriated \$700,000 for range improvements and approximately \$725,000 for range revegetation on the national forests. In addition to necessary maintenance work on existing improvements, new improvement work accomplished included construction of 230 miles of range fence and corrals, 6 miles of livestock driveways, and 157 water developments. Approximately 56,000 acres were reseeded to palatable forage species, bringing the total area of national-forest range land revegetated to date to 450,000 acres.

In the control of poisonous plants, substantial progress is being made against infestations of goatweed or Klamath weed (*Hypericum perforatum*) on national-forest ranges where the plant has become established. Goatweed, a European plant that has gone wild in this country, has been spreading rapidly since its introduction on the west coast about 50 years ago. Invasions of the plant result in marked reduction in grazing capacity; also it is poisonous when eaten in quantity by livestock. The Bureau of Entomology and Plant Quarantine has demonstrated that control can be obtained through the colonization of two imported beetles, *Chrysolina gemellata* and *C. hyperici*, which feed exclusively on this weed. Release of these insects in California has resulted in spectacular control of the weed. In the northern Rocky Mountain region, cooperative effort by Federal and State agencies, local organizations, and individual ranchers has brought about the introduction of more than 80 colonies of the insects on national-forest and private ranges. Indications of success are very favorable, and use of the beetles is expected to eliminate need for an expensive chemical control program.

Condition and trend study

An important recent development was the completion of the "condition and trend" study, mentioned briefly in last year's report. The study, begun in 1948, resulted in what is known as the "three-step method." This incorporated ideas from many other measurement methods that had been developed in the past for keeping track of what is happening to a range. The three-step method took from these the main features agreed upon as essential, and simplified them for general application to range areas. Special effort was made to develop a method that would not be too time consuming and yet would be subject to a minimum of error from personal differences in application. Range research specialists and range administrators of the Forest Service cooperated in the study.

The three-step method has proved to be reasonably rapid and accurate. Little variation occurs when different persons apply it. The method was found to be sensitive in reflecting changes in condition on a wide variety of range types. It is recommended for use primarily on the perennial grasslands, including mountain meadows,

open timber, and sagebrush-grass types, typical of large areas of national-forest range in the West. Tests of application on range units or grazing allotments have been carried out in Oregon, Montana, California, Arizona, and New Mexico.

In brief, the three-step sampling procedure consists of—

1. Measurement and observation of the essential features of vegetation and soil as recorded on permanently established transect lines and plots located on the usable parts of the range. Measurement is made by means of a small ring or loop at 100 points along each transect line.

2. Classification of these data as to condition of vegetation and soil stability and estimation of current trend in condition.

3. General and close-up photographs from permanently located photo points.

Application of the three-step method on an allotment basis requires mapping of the usable range areas by broad vegetation types and by condition situations within these types as a prelude to sampling. Trend is determined by comparison of records made at periodic intervals.

The three-step method has been adopted for general use on western national-forest ranges. It has been favorably received by stockmen and by representatives of other Federal and State agencies interested in range management. It appears to be a method of determining range trends which both stockmen and national-forest administrators can readily understand, and one in which they will have mutual confidence as an important aid in planning sound management of range areas.

Watershed Management

National forests are the principal water-source lands in the western States. They embrace the headwaters of nearly all the major streams, the higher elevation areas where the most precipitation falls and where more of it is in the form of snow. Good watershed management in the western national forests is therefore of vital importance in attaining regular, controllable water flows, modification of the peaks of floods, and dependable water supplies of good quality for western communities.

East of the Great Plains, national forests cover a much smaller proportion of the headwater areas of streams, but they do include many lands that are of great importance in local and regional water supply and flood control.

East and West, the main objective of watershed management is to get more water delivered into and through the ground, rather than to have it rush away in rapid, wasteful, soil-washing surface runoff. It is water that goes into the ground that comes out later as spring flow to feed clear streams and extend their flows into summer seasons, when water is most needed.

Generally, what is good land treatment from a watershed standpoint is also good management of the timber, range, recreation, and wildlife resources. Many areas, however, require special treatments to remedy bad watershed conditions resulting from forest fires, past overgrazing, or other causes of damage.

The Forest Service during the year expended approximately \$30,000 of flood-control funds on two emergency projects, under authority of the Flood Control Act of 1938 and subsequent acts. Both of these activities, one in California and one in New Mexico, were occasioned by forest fires which, by denuding mountain watersheds of vegetation, had created unusual flood threats to downstream areas. Emergency

measures included seeding of burned slopes with rapidly growing plants, and, where necessary, construction of small debris-retaining structures to afford downstream protection until the upper slopes become revegetated.

In Idaho, the Forest Service and the Bureau of Reclamation are co-operating on a watershed program in the Willow Creek drainage above the Arrowrock Reservoir. Prior to the present cooperative program the Forest Service reseeded 1,200 acres of range land in the Boise National Forest, and built several miles of fence to protect the area from livestock drifting in from outside range. During the last 3 years, with funds provided by the Bureau of Reclamation, the Forest Service has reseeded approximately 1,200 acres of Reclamation-withdrawn lands immediately tributary to the reservoir. Loose rock gully plugs and sediment-control dams have been constructed in the channels of intermittent streams that were degrading rapidly as a result of accelerated runoff due to loss of vegetal cover in the area. Also, the fencing of sections of channel so that willows in the channels may multiply is aiding in controlling soil movement. Destruction of the channel vegetation by fire and overgrazing was one of the things that caused the channels to cut out. Although the program in the Willow Creek Watershed is still in its early stages, a significant lessening of sediment loads carried into the Arrowrock Reservoir already is evident.

On Meadow Creek in central Utah, local stockmen and water users cooperated with the Forest Service in contour trenching and reseeding 200 acres of badly depleted lands. Several thousand acres in the watershed need special measures to increase plant cover and forage, reduce soil erosion, and prevent flood damage from torrential rains.

Problems of runoff and erosion caused by logging roads and skid trails have become worse in recent years, especially in the East, because of increased use of tractors and bulldozers in logging operations. In earlier times, most of the log skidding in the East was done with animals, with only moderate disturbance of the forest soil. Now, with heavy mechanical equipment, the job of laying out skid roads that will not develop into gullies is more difficult.

In present-day timber sale contracts in the national forests, therefore, more attention is being given to water- and soil-conservation requirements. Contracts may specify limitations with regard to location and grades of logging roads and skid roads, the drainage structures to be installed, log landing locations to minimize stream deterioration and erosion, and rules for cutting and skidding along stream courses. Protective measures to control water flow and erosion may be required during and following the close-down of sale operations until new vegetation has obtained a foothold on exposed soil surfaces. These special requirements are adapted to fit the local situations.

Recreation

Public use of the national forests for recreation increases steadily. In 1951 the national forests received 30 million visits, a 9-percent increase over 1950 and a 66-percent increase over 1941, which was the year of highest prewar use. For 30 percent of the visitors, general enjoyment of the forest environment was the primary purpose of

their visit, and another 24 percent were picnickers. Fishing, hunting, winter sports, camping, swimming, hiking and riding were other recreational activities.

Moderate charges for camping, picnicking, and swimming were continued at some of the larger, suitably developed recreation areas last year, so that the recreational activity might return some part of the cost of operation and maintenance. On a number of these areas the Forest Service was able to get competent concessioners to take over operation and maintenance, thereby relieving the Service of the cost of operating and maintaining them. This saving enabled forest officers to spend more time and money on the many smaller recreation areas where no charge was made. At most of the areas operated on a charge basis, the charge was 25 cents to 50 cents per party of six for picnicking, and 50 cents a night or \$3 a week for a party of six for camping; but at a few of the more highly developed recreation areas in the East, such as the Sherando Lake, High Knob, and Cave Mountain areas in Virginia, and Twin Lakes in Pennsylvania, a charge of 25 cents a day was made for adults and 10 cents a day for children.

In addition to the concessioner-operated areas, the Forest Service also operated some charge areas with its own personnel.

Facilities overtaxed

The operation and maintenance of free recreation areas by the Forest Service is becoming increasingly difficult as the facilities and improvements become older and as recreation use continues to increase. At many areas sanitary facilities and water systems are unsatisfactory and do not meet the minimum standards of the United States Public Health Service or of the States. Public health and safety are being endangered. Better sanitary facilities are badly needed but funds to provide them have been lacking.

Many camping and picnic grounds near population centers are frequently used far in excess of their capacity. Such overcrowding increases the rate of deterioration of the site and overtaxes the already inadequate sanitary facilities. Additional facilities are needed at many locations. The present capacity of all camp and picnic areas—41,000 family-sized units, 310,000 people—needs to be increased by some 10,000 units to relieve present overcrowding.

Because of inadequate facilities and overcrowding at existing areas, many people camp or picnic on unimproved areas where there is danger of polluting water that is used for domestic purposes. The risk of costly forest fires is greatly increased when the camper builds his fire in locations that have not been developed, fireproofed, and provided with fireplaces where camp fires can be built with reasonable safety.

Under existing law, the Forest Service cannot use any part of the national-forest receipts for maintenance or improvement of recreational facilities. For funds to provide satisfactory sanitary facilities and put other facilities in good condition at existing recreation areas and to develop new areas to accommodate the increasing demand for national-forest recreation the Forest Service must depend upon direct appropriations.

Winter sports

Winter sports areas in the national forests had almost 2 million visits in 1951, an increase of 28 percent over 1950.

In many areas during the winter of 1951-52, snow depths were from 30 percent to more than 100 percent above normal. Numerous snow avalanches blocked major highways and caused much damage. At least 18 persons were killed by snow slides in the West. But at national-forest ski areas supervised by Forest Service snow rangers there were no avalanche fatalities nor property losses, although some of these high alpine slopes that are most popular with skiers are also subject to the greatest avalanche hazards. The value of avalanche control techniques developed in recent years by Forest Service officers thus was emphatically demonstrated. The Forest Service has received requests from other Federal and State agencies and from public utility companies for assistance in combating the avalanche hazard.

The Forest Service is continuing its studies of avalanche control. Basic snow data were gathered last year at the Alta ski area in Utah, Berthoud in Colorado, and the Stevens Pass and Mount Baker ski areas in Washington.

Wilderness areas

The 78 national-forest wilderness areas, totaling some 14 million acres, are being used by increasing numbers of wilderness devotees. Protection and management of these areas pose many problems, especially those brought about by private holdings within the wilderness area boundaries, by the application of the mining laws to lands in these areas, and by demands for commodity uses and for roads and airfields in the areas.

That there is widespread interest in wilderness recreation is evidenced by the attendance at public hearings which are held whenever a change is proposed. At a public hearing conducted by the regional forester for the southwestern region in August 1952, relating to proposed changes in the Gila Primitive Area, Gila National Forest, N. Mex., more than a thousand people made statements. The record of the hearing showed that the interest was national in scope.

The President's Executive order creating an airspace reservation within which flying was banned over the Superior roadless areas in Minnesota became fully operative on January 1, 1952. The airspace ban was immediately challenged by several persons who made deliberate violations to test the legality of the order. The Department of Justice entered suit, asking an injunction. The decision of the United States District Court of Minnesota upheld the validity of the airspace reservation.

Special Land Uses and Mining***Special uses***

Use of national-forest land for various specified purposes may be authorized by special-use permit. More than 50,000 permits were in force during the year for a wide variety of purposes, including summer homes, resorts, ski lifts, pastures, pipe and telephone lines, fences, etc. Some 21,600 permits for uses of a noncommercial nature were issued free. Charge permits yielded \$666,197 in fiscal year 1952, an increase of \$10,000 over 1951.

Mining leases

Approximately 3¾ million acres of national-forest land are under lease or permit for exploitation of oil and gas or other minerals, under the acts regulating leasing of acquired land and public land. Most applications received during the year were for leases in western and southern national forests. There were also a number in Ohio and Michigan, and considerable interest was evidenced in oil and gas on the Monongahela National Forest in West Virginia. Extensive prospecting for lead is under way in the Ozarks of Missouri and for copper and nickel in the Superior National Forest in northern Minnesota. The Forest Service made 235 reports on applications for mineral permits and leases on acquired lands during fiscal year 1952. The Bureau of Land Management issued 285 leases covering 160,000 acres of acquired national-forest land. These leases and permits yielded a revenue of \$238,233 during the fiscal year 1952, an increase of \$89,475 over 1951.

On lands acquired under terms of the Weeks law, the Secretary of the Interior, with the consent of the Secretary of Agriculture, may issue leases for the exploitation of minerals. In reporting on applications for such leases, the Forest Service seeks both the furtherance of mineral production and the protection of surface resources for timber production, watershed protection, forest recreation, and wildlife, in line with the basic multiple-use policy for the national forests. In each case a determination must be made as to whether mineral use can be carried out in harmony with the surface uses, with or without special requirements to protect those uses. Where harmonious utilization is impractical a determination of relative values is made. It may be determined, for example, that, in the best public interest, strip mining should be prohibited altogether on a valuable watershed or recreation area, but that it should be permitted in areas where minerals are the most important resource. When mineral development results in destruction of the surface, the operator is required to restore the surface to productivity and to reimburse the United States for surface values destroyed.

The United States mining laws and mining claims

The Forest Service wishes to encourage proper mineral exploration and development in the national forests. In those national forests created from the public domain, the general mining laws give any individual the right to locate, enter, and patent mining claims on national-forest land. The law makes no requirement, however, that mining be done on the land after patent, and it provides no checks against damage to soil, timber, water, or other values. The law is vulnerable to abuses, and it results in many mining activities decidedly contrary to the public interest. Other values far in excess of the mineral values often are included in mining claims. Timber values of \$25,000 or more per 20-acre claim are not uncommon in the national forests of California and the Pacific Northwest. There is need for revision of the mining laws so that the surface resources and values of the national forests will be safeguarded without impairing bona fide mining development. Separation of the surface and mineral

values is desirable, with the mineral locator or patentee acquiring the right to use as much of the surface or timber as may be necessary in the development of his claim.

Wildlife

More and more people are taking an interest in hunting and fishing. But each year more private lands are posted, and more restrictions are being applied on many of the private lands still open to sportsmen. The result is that hunting and fishing "pressure" on the public lands is rapidly increasing. The national forests, because they comprise the largest area of publicly owned, good-quality wildlife habitat in the United States, are feeling this pressure more than ever before. Last year an estimated 5½ million hunters and fishermen visited the national forests. They bagged a total of 358,000 big-game animals. Fishermen and small-game hunters likewise had excellent sport. The fishermen had at their disposal 81,000 miles of streams and 1,650,000 acres of natural lakes supporting a large variety of game fish.

If the national forests are to keep up with the demands for high-quality hunting and fishing, more intensive habitat management will be essential. The management work on the ground must be backed by further development of habitat-management techniques. This is especially important where management of wildlife habitat involves modification in the management of other resources such as timber and forage. Much more knowledge is needed.

The Forest Service and State wildlife conservation agencies have made much progress in the development of cooperative wildlife management programs. There are possibilities, however, for much further development of the national-forest wildlife potential through such cooperative programs.

State wildlife conservation agencies find certain advantages on national-forest areas. In addition to the important matter of providing free access to sportsmen, the national forests offer greater continuity in type of land management and greater stability of management policy than may be found on many private lands, even when these lands may be open to public hunting and fishing. Moreover, the Forest Service attempts to give purposeful management to the wildlife habitat in the national forests and to coordinate the wildlife-habitat management with other phases of forest management.

Examples of progress

Substantial progress in Forest Service-State cooperative wildlife management occurred in a number of States during the past year. In West Virginia a new State law was enacted providing for special stamps for hunting and fishing on national-forest land in the State. The funds collected by the State through sale of these stamps will greatly strengthen an already fine cooperative management program. Recent adoption of a similar stamp by the State of Florida for special areas in the national forests likewise will make possible a more intensive cooperative wildlife management program in that State.

A new cooperative wildlife management area was established during the year in the Conecuh National Forest in Alabama.

In Pennsylvania, a unit manager has been assigned by the State to one of the cooperative management areas in the Allegheny National Forest. Habitat-improvement crews made excellent progress during the year.

Arizona has a unit manager assigned to the Three Bar Cooperative Quail Management Unit in the Tonto National Forest. A long-time habitat-improvement program is planned. The cooperative program for Arizona's famous Kaibab National Forest deer herd was strengthened by an increased contribution of State funds.

The cooperative wildlife management program in Virginia, now in its thirteenth year, saw development of new techniques in habitat management in the George Washington and Jefferson National Forests. An experiment with controlled hunting was tried for the first time.

In the management of big-game herds in the national forests, overpopulation is still a problem in many places, and in some areas it is becoming more critical. However, several States have taken new steps toward meeting the problem. New legislation providing for more liberal harvesting of antlerless deer has been enacted in Pennsylvania, West Virginia, and Utah. Management programs which resulted in more adequate harvests of surplus big game were started or continued in several other States.

Some progress has been made in developing coordinated habitat-improvement techniques that may be suitable for application on a broad scale. In the Pisgah National Forest in North Carolina, experiments indicate that an abundance of deer browse can be produced in hardwood forests through clear cutting in limited areas or heavy selective cutting, which at the same time is within acceptable limits of good management from the standpoint of timber production.

Methods of revegetation of depleted browse range for big game were studied in Oregon and Idaho. Results with such important species as bitterbrush, while not conclusive, gave promise of developing suitable revegetation procedures. Studies on the relationship between logging and fish and game habitat were started in Colorado and in Oregon.

Fire Control

During the calendar year 1951, the Forest Service controlled 10,385 forest fires in the national forests. This exceeded by 282 the number of fires fought during 1950. In the first 6 months of 1952, 3,459 fires were fought and controlled, compared with 3,519 fires in the same period of the preceding year.

The incidence of lightning-caused fires was unusually high in several localities during the late summer months of 1951, notably in northern California, where a larger concentration of forest fires from a single thunderstorm occurred than in any other recent year. In this area 565 fires developed from a single storm in August. Because sufficient attack forces were not available to control all these fires while they were still small, it was necessary to recruit 4,800 men to help control those that became large.

During 1951, 383,886 acres of forest and watershed inside the national forests were burned over, compared with an annual average for the preceding 5 years of 233,084 acres.

From January 1 to August 31, 1952, 59,819 acres were burned, compared with a 5-year average for the period of 186,516 acres.

Severe drought conditions prevailed in New Mexico, Arizona, and California during the 1951 fire season. Western Washington and Oregon experienced the driest fire season since 1922—so dry that commercial lumbering was halted for a period in late summer by order of the State authorities. Southern Colorado, Nevada, and Utah suffered from a prolonged drought, as did localized areas in other States.

The summer and fall season in 1951 was one of the worst periods for the national forests in many years, measured in terms of timber killed and other resources damaged by fire. A billion board feet of timber was killed—sufficient, if cut into lumber, to build 100,000 small family homes. About 100,000 acres of young growth upon which future timber crops depend was destroyed. Watershed damage was heavy, particularly in California, New Mexico, and Arizona. Damaging flash floods have already resulted from heavy rains falling on some of the areas burned in 1951. There were many additional losses to local communities, such as loss of water for irrigation, hydroelectric power, and domestic uses, and loss of business and employment.

Fire line construction and use of specialized equipment

It was necessary to construct 3,700 miles of fire line to control the 10,385 fires that occurred in 1951. Such a line-building job is a burdensome undertaking when much of it must be accomplished during hours of darkness in rough, mountainous country, and with the fire often pressing to break over the line.

Tractor dozers and plows were used to construct approximately 1,800 miles of the fire line during the year. Tank trucks were dispatched to 2,200 fires. Communication on fires was improved by the use of 6,000 radio transceivers. Power saws were used to fell thousands of snags along fire lines and thus prevent spot fires. Such use of specialized equipment saved thousands of acres of forest land which undoubtedly would have burned if forest officers had had to rely wholly on hand tools to gain control of the fires. Additional modern equipment could do much to increase the effectiveness of the manpower available.

Use of aircraft

Airplanes were used during the year to transport more than 12,000 men and approximately 2,000,000 pounds of fire supplies, of which about a million pounds were dropped to fire fighters working on fires in inaccessible country. Approximately 12,000 hours of flying were necessary. In addition more than 1,000 flights were made with helicopters.

Smokejumpers made 1,200 jumps to 334 fires during the year. About \$750,000 of fire-suppression costs were saved because smokejumpers arrived on fires early enough to control them.

Missoula smokejumper headquarters

For the fiscal year 1953, Congress made a special appropriation to provide new headquarters for the Forest Service smokejumper corps. Work has been started on a 150-man dormitory, parachute loft, and warehouse, adjoining the Missoula airport in Montana. This smokejumper plant will replace temporary buildings used heretofore which

are no longer suitable and are poorly located for prompt get-away to fires. It is expected that the new headquarters will be completed in time for use during the 1954 forest fire season.

Losses not inevitable

Damages caused by forest fires were very severe last year in the areas where drought, high-velocity winds, and prolonged periods of high temperatures occurred during the fire season. The fact that heavy resource losses are usually associated with such bad fire weather conditions does not mean, however, that disastrous losses must be considered inevitable whenever the weather is unfavorable. On the contrary the potential effect of critical fire weather on resource losses can be greatly lessened through adequate implementation of fire plans designed to control, in their incipiency, the fires which occur under such conditions. Hence, the heavy losses during the last half of 1951 cannot be charged to critical fire weather conditions alone. They are due in part at least to the fact that the Forest Service still lacked the manpower and equipment for a fire organization adequate to cope with all fires occurring under severe burning conditions.

The cost of fire fighting has risen. In 1920 fire fighters could be hired for 20 cents per hour. During the 1927-38 period hourly wages were about 35 cents. In 1946 they rose to 77 cents. In 1951 the Forest Service had to pay average hourly wages of \$1.15 per hour for fire fighters. Other operating costs have increased in the same proportions. Thus, the dollars made available to the Forest Service for fire control today buy much less than they used to in manpower and equipment.

With the help of the Civilian Conservation Corps, the Forest Service was able to construct many fire-control facilities, such as telephone lines, lookout towers, and guard cabins during the 1930's. Many of these facilities have now depreciated to a point where heavy maintenance or complete replacement is required. Maintenance and construction funds available have not been sufficient to accomplish the rehabilitation job.

With the new types of equipment and modern techniques now available, the Forest Service has developed plans which it is hoped will assure early control of practically all fires, even those starting under the most unfavorable fire weather conditions. It is confident that the large resource losses which now occur each year in which fire weather conditions are critical, can be stopped when the Service is able to put into operation fully the fire-control plans that have been developed to protect the resources of the national forests.

Improvements and Facilities

Roads and trails

A total of \$18,590,105 was made available for construction and maintenance of national-forest roads and trails in fiscal year 1952. Of this total, \$13,000,000 was from appropriations authorized by section 3 of the Federal Aid Highway Act of 1948, and \$5,590,105 was "10 percent funds"—10 percent of national-forest receipts for fiscal year 1951—allocated for roads and trails as authorized by the act of March 4, 1913. The funds were programed as follows: \$8,553,000 for maintenance of 206,719 miles of forest development roads and trails;

\$2,700,000 for replacement of 577 unsafe bridges on national-forest roads and trails; \$2,696,605 for reconstruction and surfacing on 643 miles of roads, of which 393 miles are used in hauling timber; and \$4,640,500 for construction of 157 miles of new timber access roads in Arizona, California, Idaho, Minnesota, Oregon, and Washington.

Supplementing the construction work of the Forest Service, purchasers of national-forest timber are building approximately 1,500 miles of permanent road annually as part of timber-sale agreements. Combined purchaser and Forest Service timber access road construction and reconstruction for fiscal year 1952 totaled some 2,050 miles.

Recent Forest Service estimates indicate that about 1,900 miles of road construction and reconstruction will be needed annually for a period of 5 years in order to maintain the present annual cut in the national forests. During the same period, to make the currently attainable sustained-yield capacity of 6.6 billion board feet annually available from the national forests, an additional 7,200 miles of road must be built. Timber road construction and betterment at the 1952 rate of 2,050 miles per year will provide the roads necessary to maintain the current cut, but will allow only slight progress toward making additional timber available. At this rate, some 50 years would elapse before the current rate of construction would make the currently estimated capacity of the national forests available for peacetime use, or accessible in case of a national emergency. The need for accelerated construction of timber access roads continues to be acute.

Transportation system

The existing national-forest transportation system consists of 133,259 miles of forest highways and truck roads, 124,700 miles of horse and foot trails, and 112 airplane and helicopter landing fields. States and counties maintain 40,030 miles of the forest highways and roads on the national forests; 10,510 miles of road are maintained by purchasers of national-forest timber and other users of national-forest roads; 700 miles of trail are maintained by cooperators. The remaining 124,000 miles of trail and 82,719 miles of road are maintained by the Forest Service.

In the national-forest transportation system, 58 percent of the road mileage, 75 percent of the trail mileage, 35 percent of the 11,000 road and trail bridges, and 30 percent of the landing fields are of suitable standard and in suitable condition for all general purposes and public use. The remainder of the transportation-system facilities are usable for fire protection but are usually inadequate for other classes of traffic and often unsafe for public use. Originally built to low standards and primarily for fire protection, these roads and trails and bridges were neglected during World War II when maintenance work was largely suspended. Since 1946, 2,931 of the most critical bridges have been replaced. Additional replacements are scheduled at the rate of 600 per year, with culverts replacing about 40 percent of the former bridges. Reconstruction of former protection roads to accommodate recreation and other public traffic is proceeding slowly while the urgency of timber access road construction gives prior emphasis to construction or reconstruction for that purpose.

Water developments

During the year more than 50 dams were built on national-forest lands by irrigation farmers, power companies, and Federal agencies

(Bureau of Reclamation and Corps of Engineers). The many proposals for multiple-purpose water developments in mountainous head-water areas, where the national forests lie, bring new problems of insuring proper consideration for forest resources such as timber, recreation, wildlife, and grazing in the areas involved.

Power projects totaling in excess of a million horsepower are currently under construction on the national forests. Demands for additional hydroelectric energy presage continued activity in this field. Use of the new power created will mean additional wealth for the local communities. Last year more than 1,000 power cases were handled by the Forest Service, collaborating with the Federal Power Commission. These brought into the Federal Treasury over a quarter of a million dollars in right of way charges.

Ten reservoirs were built wholly or partly on national-forest lands by farmers for irrigation storage: two in Montana, two in Colorado, one in Arizona, two in Utah, two in Idaho, and one in Oregon.

Mapping

During fiscal year 1952 the Forest Service cartographic organization completed control surveys and topographic maps for 1,540 square miles of national-forest and adjoining lands in Arizona, California, Idaho, and Kentucky.

Planimetric maps were completed on 14,700 square miles of national forests and adjoining lands in Montana, Oregon, Washington, California, Colorado, New Mexico, and Pennsylvania.

Contracts for aerial photography for both national-forest mapping and resource inventory purposes were awarded for a total of 20,117 square miles. Bids were pending at the end of the fiscal year for an additional 8,752 square miles.

Thirty-five national-forest administrative and recreation maps were printed during the year.

A procedure was developed whereby old public-land surveys and metes-and-bounds property lines may be retraced with the aid of aerial photographs and photogrammetrical processes, transferred to maps and reestablished on the ground at far less expense than costly resurveys by conventional methods. This will reduce the cost as well as expedite action on many boundary surveys required in connection with timber sales, control of trespass, and other administrative problems.

Housing

The Forest Service is faced with an acute problem in providing housing for employees at outlying stations where commuting from centers of population is impractical. Many stations built 30 or 40 years ago are inadequate for present-day needs. Many have now deteriorated beyond the point of practical repair. The high percentage of men with families among new employees recruited largely from the ranks of World War II veterans make more family quarters necessary at ranger stations than was the case in earlier years. Resourceful forest supervisors and district rangers are able to meet the situation in some cases by converting former equipment sheds to dwellings, salvaging some CCC and Army camp buildings and moving others closer to fire-control and work centers. Improvement construction funds available after the maintenance of existing structures have permitted construction of only 6 or 7 new residences annually during recent years.

Equipment

The Forest Service inventory of equipment for administration, fire protection, tree planting, range reseeding, road maintenance and construction in 1952 consisted of 6,400 passenger-carrying and transportation vehicles, including fire trucks; and 1,200 tractors, graders, compressors, and similar units of construction equipment. The 1952 inventory of transportation units was slightly less than that of a year earlier, 5 percent less than that for 1947, and 20 percent less than the 1941 inventory.

The 1952 construction equipment fleet was 1,000 units below that in use before World War II. The reduction is due in part to smaller construction programs. Also more of the heavier construction is now being contracted; and there has been continuous effort to improve work scheduling, including staggering work when possible on adjoining or nearby national forests in order to make each piece of equipment available for two or more forests.

National Forest Properties

National-forest properties on June 30, 1952, included 153 national forests, 31 purchase units established with approval of the National Forest Reservation Commission pursuant to the Weeks law, 16 experimental forests, and 12 land utilization and other projects. These included a gross area of 229,164,852 acres and a net area of national-forest land and other land administered by the Forest Service of 181,130,393 acres.

The significance of these national-forest properties, however, is much greater than can be indicated merely by number of administrative units or number of acres. These lands are parts, and in some instances the major parts, of the watersheds of many of our important streams. They include some 76,000,000 acres of commercial timberland managed with the objective of producing continuous crops of timber for the industries and commerce of the Nation. They include grazing lands important to the livestock industry. They provide a great number of recreation areas, where millions of our people hunt, fish, camp, or picnic, and enjoy the scenery and forest environment each year. The national-forest properties thus mean regulated water flows, forage for livestock, a sustained flow of raw materials for all the products made of wood, and a sizable contribution to business enterprises and permanent payrolls that are part of the economic backbone of the Nation.

Land purchases

For the fiscal year 1952 Congress appropriated \$75,000 for the purchase of lands in the national forests under the Weeks law of 1911; \$138,996 pursuant to the several "receipts acts," and \$125,000 for acquisition of privately owned lands within the Superior National Forest roadless area, as authorized by Public Law 733 of the Eightieth Congress. The National Forest Reservation Commission approved the purchase of 6,154 acres of lands from the Weeks law funds; 3,864 acres involving 16 tracts were approved for purchase with funds appropriated under the receipts acts; and 3 tracts comprising 163 acres were approved within the roadless area of the Superior National Forest. The greater part of the appropriations for consolidation of the Superior

roadless area are being held pending the working out of transactions involving certain key tracts on which commercial resorts are now operating. The appropriation for purchases of land pursuant to the Weeks law made possible the acquisition of a number of tracts needed for more economical forest management.

Forest exchanges and donations

The exchange of national-forest land or timber for privately owned, county, or State lands within or near the national forests also provides an opportunity for adjustments of land use and ownership in the interest both of improving opportunities for private forest management and of more economical national-forest management and better resource use. During the fiscal year, 175 exchanges were approved, in which 85,970 acres of land were offered to the Government in exchange for 23,238 acres of national-forest land and 63,033,000 board feet of national-forest timber.

In addition to the purchase and exchange transactions, 9 donations totaling 80 acres were accepted for national-forest purposes. Of these, 9 acres were donated primarily for administrative sites. The remaining lands are suitable for timber growing and other national-forest purposes. Thirteen small tracts were purchased pursuant to the act of March 3, 1925, as amended, for administrative sites or as additions to existing administrative sites.

Boundary adjustments

Several boundary changes and adjustments were also made during the year to promote more effective administration. The Santa Rosa division of the Toiyabe National Forest in Nevada was transferred to the Humboldt National Forest by Public Land Order No. 819. The boundaries of the Shasta, Modoc, and Klamath National Forests in California were changed by interforest transfers by Public Land Order No. 804. Pursuant to section 11 of the Weeks law, five national forest purchase units in Ohio and four in Indiana were designated as the Wayne and Hoosier National Forests, respectively.

A total of 754 acres of public-domain land was added to the Ocala National Forest by Public Land Order No. 750. A tract of 2,319 acres was released from a military withdrawal and became part of the Boise National Forest in Idaho.

In Alaska, about 76,000 acres were eliminated from the Chugach National Forest by Public Land Order No. 797. These lands are by this action returned to the jurisdiction of the Bureau of Land Management for use and disposal under the public land laws. The purpose was to facilitate their classification and disposal under homestead and small tract laws to accommodate the accelerating demands for lands for farms and homes in the area.

COOPERATION IN STATE AND PRIVATE FORESTRY

Forest Management Assistance to Woodland Owners

Thirty-eight State forestry departments are cooperating with the Forest Service in providing technical assistance to owners of private forests and to small sawmill operators and other processors of primary forest products. The Cooperative Forest Management Act of 1950,

which replaced the Norris-Doxey Cooperative Farm Forestry Act on July 1, 1951, is the basis for this cooperative program.

The change-over to operation under the new act was made with no lost motion on the part of the foresters employed in the program, and with no interruption in handling landowner requests. Both farm and nonfarm owners of small forests are now advised and assisted in making simple plans for the management of their woodlands; in marking the trees in need of cutting; in measuring these trees and estimating their volume; in determining the proper cutting and logging methods to use in the harvesting operation; and in marketing the harvested products. In addition, many owners are advised on planting, thinning, and pruning operations, as well as on the protection of their forests from fire, insects, and disease.

The local forester who handles this cooperative forest management project work is called the service forester. In some localities, however, he is referred to as the farm forester, project forester, county forester, or district forester. In fiscal year 1952 some 250 of these technically trained State-employed foresters assisted 27,933 woodland owners to establish better management practices on 2,501,317 acres of woodland. Products harvested under their guidance amounted to 609,562,000 board feet of saw timber and other forest products. In addition 1,088 barrels of gum naval stores, 153,013 gallons of maple sirup, and quantities of Christmas trees, holly, nuts, tree seed, pine cones, and other miscellaneous products were harvested. The forest owners received a total of \$13,924,940 from the sale of these products.

Few of the cooperating States as yet have funds available to employ processor specialists to furnish technical assistance to small sawmill operators and to other processors of primary forest products. The service foresters in the course of their regular duties, however, assisted 6,617 forest products operators.

Cooperation with private foresters

For many owners, the woodland management job and its prospective returns are large enough to warrant the employment of private forestry consultants. Cooperation between the local Cooperative Forest Management service foresters and private consulting foresters is stressed. The State-employed service foresters referred 661 woodland owners with 429,563 acres of woodland to private practicing foresters. As more foresters enter private practice some of the tremendous burden on the CFM service foresters will be lightened. Some 41¼ million small owners, holding three-fourths of the private, commercially productive forest land in the United States, need varying amounts of on-the-ground technical forest management assistance if their woodlands are to be made and kept productive. In addition there are some 50,000 small sawmill operators and processors, many of whom could operate more efficiently if they could get technical guidance. Service to this small-operator group is just getting started by the cooperating States and Federal Government. Few private practicing foresters as yet have given attention to this field of work.

At the end of the fiscal year the service foresters had a backlog of 4,623 unfilled requests for technical assistance. Numerous project areas are still too big for adequate coverage by the foresters assigned to

them, and many woodland owners who requested service could not be reached. Large areas in a number of States have no service at all, because neither a public nor a private forester is available.

Farm Forestry Extension

The Extension Service of the Department of Agriculture cooperates with State agricultural extension services of the land-grant colleges in conducting extension forestry work under section 5 of the Clarke-McNary Act. The Forest Service also cooperates in this work as the subject-matter specialist agency. The program provides farm owners with educational assistance in woodland management, shelterbelt establishment, and in harvesting, marketing, and utilizing forest products.

Since woodlands in many States contribute a large part of the farm income, forestry must necessarily be considered in plans for farm management as developed by county agents and other agencies. Although conducted therefore as part of the agricultural extension program, the extension forestry program also is developed as a part of the broad State program for forestry, and is coordinated closely with the on-the-ground assistance available to woodland owners through State forestry departments in the cooperative forest management program.

The extension forestry program emphasizes the use of technical information and practices in the growing and management of timber as a crop on the farm. Every effort is made to build up the forestry knowledge of woodland owners so that they will have sufficient "know-how" for carrying on work in this field as they do with other crops. This is accomplished by providing owners with practical forestry information, conducting training schools, demonstrating forestry practices, and by conducting tours to forestry research units and to successful operations of individual owners. Forestry bulletins and the press and radio are used in calling attention to sound practices and the benefits to be gained by good forest management. County agents, county or community committees, and farmers serving as forestry leaders have important responsibilities in planning, organizing, and conducting extension forestry work.

Forty-five States and Puerto Rico last year employed one or more extension foresters to conduct the State programs. During the year, extension foresters gave intensive forestry training to county agents and local leaders who assumed a large share of the responsibility for conducting forestry educational activities in the counties. Also county committees and advisory groups in a number of States had a part in discussing problems and shaping programs in tree planting, woodland management, marketing, timber estimating and appraisal, preservative treatment of fence posts, prevention of farm fires, and the production of naval stores and maple sirup.

Mechanized equipment

Farmers showed much interest in demonstrations of equipment for mechanizing farm forestry operations. Equipment demonstrated included tree-planting machines for reforesting idle lands and establishing windbreaks and shelterbelts, maple-tree tapping machines, and

wood-chipping machines for making mulch for orchards and gardens or bedding for use in poultry houses and dairy barns. Demonstrations of power saws and other logging equipment also attracted large groups. The fact that timber values have reached an all-time high has stimulated more interest in close utilization, and in applying better cutting practices with a view to harvesting timber crops at frequent intervals.

Chemical treatment of fence posts with preservatives has made notable progress. Demonstrations showing preservative processes, and permanent fence posts exhibits established at county fairs, are being used to tell the story of good fence-post treatment and proper fence construction.

Farm youths receive forestry instruction through forestry projects and other educational activities conducted as a part of the 4-H Club program. Forestry training camps for 4-H Club members have increased rapidly in number and in enrollment. Several State camps and numerous county camps were held last year. During the past year 169,029 4-H Club boys and girls received training in forestry, 214,373 in wildlife conservation, and 592,984 in fire and accident prevention.

Cooperative Tree Planting

Total production of trees for forest and windbreak planting by all nurseries—Federal, State, industrial, and commercial—was approximately 450 million in 1951. Of this quantity, 292 million trees were distributed to landowners by the States, with the cooperation of the Federal Government as authorized by section 4 of the Clarke-McNary Act. Although there have been other years of greater total production, this 292 million figure was the greatest “C-M 4” production yet achieved. It represented five-eighths of the nation’s total tree-planting accomplishment for the year.

State nursery expansion has increased production some 500 percent since 1944. Many of the States, however, were still unable to fill all orders for tree-planting stock, and few State forestry departments were able to push reforestation and shelterbelt planting aggressively, as they would like to do. Shortages occurred in 20 States, and may have amounted, all told, to as much as 60 million trees. To help meet the demand for trees, many of the State foresters traded stock among themselves, bought stock as available from commercial nurseries, and made long-term contracts for future delivery with other State, Federal, and commercial nurseries.

Further State nursery expansion is under way. Seven of the States are building new nurseries, and twelve are expanding existing nurseries. When these are completed, the total capacity of State forest-tree nurseries will approximate 500 million trees a year, but it will still be small when measured against the millions of acres of denuded or understocked forest land in the United States that need to be reforested.

Cooperative Fire Control on State and Private Forest Lands

Under authorization of the Clarke-McNary Act the Forest Service continued cooperation last year with 43 States and Hawaii for the protection of State and privately owned lands from fire. This was

the forty-first year of such cooperation. It was first started in 1911 under authorization of the Weeks law. The program was greatly broadened and strengthened by the Clarke-McNary Act of 1924.

For State and private forces as well as for those on the national forests, the fire season in Oregon, Washington, and parts of California and Idaho in 1951 was one of the most severe on record. Missouri, Louisiana, Mississippi, and Alabama also had unusually difficult seasons. These were the "hot spots" in the cooperative protection program during the year.

A total of 97,230 fires was reported on State and private protected lands. The States estimated that another 58,222 fires occurred on unprotected areas. The total of 155,452 fires was below the 199,982 total for the preceding year.

Wild fires on protected State and private forest lands burned 3,055,505 acres, or 0.84 percent of the area protected. On unprotected lands, according to the best estimates available, 7,254,666 acres burned, or 11.46 percent of the total unprotected area.

In spite of the unusually bad fire weather in several States, the State protection agencies held the Nation-wide average of area burned per fire to 31.4 acres. The 1950 average was 35.3 acres.

Large area still unprotected

Of the 426,694,000 acres of State and private forest and watershed lands needing protection in the United States, 363,414,000 acres are now under organized protection, leaving 63,280,000 without the benefit of any organized protection efforts. Cooperative protection was extended to an additional 2,850,000 acres during the year. But in many States the protection in organized areas is still spread much too thin to cope successfully with a really serious or prolonged fire season. It needs to be strengthened by more well-trained men and more equipment.

For the fiscal year 1952 Congress made \$9,423,500 available for Federal participation in the cooperative protection program. Latest expenditure records available are for the fiscal year 1951 during which the States and private owners spent \$24,163,877 for the program, and the Federal Government \$9,480,000, or a total of \$33,643,877. In addition to this amount used in the "C-M 2" program, lumber companies and large timber owners spent over \$8,750,000 for special fire-control equipment, improvements, and services.

Ninety-eight percent of all the fires in 1951 were man-caused, and therefore preventable. Of these man-caused fires, 77 percent occurred in the 11 Southern States. Forestry agencies in the Southern States are giving increased study to the reason behind the cause of these numerous man-caused fires and are endeavoring to devise successful means of reducing their number.

Naval Stores Conservation Program

The naval stores conservation program provides assistance to gum turpentine farmers who follow conservation practices in the Southeastern States of North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi. It is authorized by the Soil Conservation and Domestic Allotment Act and is administered by the Forest Service for the Production and Marketing Administration.

The active naval stores producing area is a belt from 50 to 100 miles wide extending along the Atlantic seaboard and the Gulf of Mexico. It comprises a gross area of about 50 million acres. In this area there are more than 8,000 producers, working about 63 million longleaf and slash pine trees for the production of turpentine and rosin, the two main products known as naval stores. Georgia has 87 percent of the producers and 75 percent of the timber worked. Florida has 6 percent of the producers and 17 percent of timber, Alabama 5 percent of producers and 5 percent of timber. The few score remaining producers are in Mississippi, North Carolina, and South Carolina.

The program is designed to encourage producers to adopt and carry out good naval stores and forestry practices, adapted to the conditions and timber stands on their properties. The 1951-52 program provided payments at specified rates per face on tracts where trees were worked to a minimum diameter of 9, 10, or 11 inches. A payment was provided for selective cupping where tracts having a minimum of 50 trees per acre were cupped in a manner that would result in leaving as many trees in the stand uncupped as those which were cupped. A payment also was provided for restricted cupping.

In addition to following the practices for which payments are made, a producer in order to receive any payment had to follow good timber-cutting practices and cooperate with the State's fire prevention and suppression programs.

In the 1951-52 season, 3,322 producers participated in the program with 49 million trees. Comparable figures for the preceding year were 3,069 producers and 51 million trees.

The most outstanding recent improvement in working trees for naval stores has been the use of the bark hack with sulfuric acid solution sprayed on the streak to stimulate and prolong the flow of gum. This technique, developed by the Forest Service, will produce as much gum from half as many streaks as were required with the old wood-chipping method. The method therefore saves much labor. Trees can be worked longer, and because only the bark is removed, the tree can be utilized for wood products with little or none of the loss that occurred from deeply scarred faces when the old wood-chipping system was used.

Promotion of chemical stimulation by the naval stores conservation program foresters has resulted in adoption of the method by an increasing number of producers. In 1949, 5 percent of the producers used the treatment on 6 percent of the faces. In 1950, 9 percent used it on 17 percent of the faces. In 1951, 21 percent of all gum turpentine producers in the naval stores belt used chemical stimulation on 29 percent of all faces.

The foresters assigned to field administration of the program give much effort to promoting good timber management generally—not only for the production of naval stores but for all forest products.

Pest Control

Representatives of forestry, industry, and conservation interests were asked by the Secretary of Agriculture in 1952 to serve as a committee of consultants on questions arising in connection with the Department's activities under terms of the Forest Pest Control Act of

1947. This act authorizes a broad program for the control of destructive insects and diseases attacking the forests. Members of the advisory group, and the organizations represented, are:

A. H. McAndrews, Syracuse, N. Y. (Forestry School Executives.)
Ernest L. Kolbe, Portland, Oreg. (Forest Industries Council.)
Fred H. Lang, Little Rock, Ark. (Association of State Foresters.)
D. Clark Everest, Rothchild, Wis. (American Forestry Association.)
Walter Damtoft, Canton, N. C. (Society of American Foresters.)
Fred W. Roewekamp, Los Angeles, Calif. (Association of Park Executives.)

Coordination of Departmental Forestry Activities

The Secretary of Agriculture's Memorandum No. 1278 marked a significant advance in achieving coordination of the Department's farm forestry activities. In one section of this memorandum the Forest Service was assigned major responsibility for farm forestry work.

During the past year three agencies—the Forest Service, Soil Conservation Service, and Production and Marketing Administration—drew up an agreement detailing their responsibilities under the Secretary's memorandum. For the first time the Forest Service has actively participated with the Production and Marketing Administration in developing the forestry practices to be included in the agricultural conservation program and the rates of payment for these practices. The Soil Conservation Service and the Production and Marketing Administration have been of considerable assistance to the State forestry agencies in interesting farmers in good woodland management. On their part the State Forestry agencies, which are the local administrators of the cooperative Forest Service-State programs, have been a major factor in achieving the coordination of farm forestry work.

In general, this cooperation has resulted in substantial progress toward greater recognition of the important place of forestry in farm conservation plans, better technical formulation of forestry practices in State farm conservation programs, and increased interest of farmers in forestry practices under the agricultural conservation program.

RESEARCH

Research continues to be directed toward the development of new scientific facts as a basis for more efficient management, protection and utilization of the renewable resources of timber, range, and water. This research is carried on by the Forest Service at 11 regional experiment stations in the continental United States; at a tropical forestry station in Puerto Rico, at a research center in Alaska, and at the Forest Products Laboratory at Madison, Wis. Much of the work is concentrated on experimental forests and ranges. In many cases it has been strengthened and expanded by cooperative participation on the part of other Federal, State, and private agencies and individuals.

Special emphasis has been given to these cooperative and coordinating phases of the research program during the past year. A National Advisory Committee on Forest Research was appointed. This Committee, functioning within the framework of the advisory

committee system developed by the Agricultural Research Administration, will serve as a valuable aid and guide in developing a realistic and balanced research program.

As a result of these and other favorable circumstances, much that is worth while has been done. In the following pages are examples of some accomplishments of the past year in research dealing with the management and protection of forest and range lands, and with the utilization of forest products.

Forest Management

New check list of trees

A job completed in 1952 was the compilation of a new Check List of Native and Naturalized Trees of the United States. This publication will give the accepted scientific names, common names, and geographic ranges of all species of trees in this country. Trees of Alaska and Canada also are included. More than 1,000 species, varieties, and recognized hybrids are listed. Notes and references on nomenclature are included; and for each species various common names in local use other than the approved common name are given. Also included are a botanical index of plant families and genera, and a list of tree names used in the lumber trade. The new check list will be published as Agriculture Handbook No. 41 of the Department of Agriculture. It is expected to be off the press early in 1953.

Renewing forests

Seeds of all important Northwest tree species can be stored for at least 6 years without loss of viability if held at temperatures of freezing or lower. This information comes from a cooperative study by the Pacific Northwest Station and the Boyce Thompson Institute. Reforestation has become a large and growing undertaking in the Northwest region, with well over 300,000 acres planted by all agencies to date. Since good seed crops do not occur every year, large quantities of tree seed must be stored in order to assure adequate supplies for nursery and direct seeding operations.

That diskings can provide adequate stand regeneration of certain Lake States pulpwoods at a cost only 20 to 25 percent of the cost of planting was shown by a series of tests by the regional forest experiment station. Success requires an adequate supply of viable seed, 40 to 60 percent of the surface in recently exposed mineral soil, and abundant rainfall in the first two growing seasons following treatment.

Small-scale tests made by the Rocky Mountain Station have indicated that the lodgepole pine and spruce-fir forests of this region can be regenerated satisfactorily by alternate-strip clear cutting. The merits and defects of the method in actual practice are now being tested in a large-scale pilot plant experiment involving some 6½ million board feet of merchantable timber.

In Puerto Rico, observations in plantations of broadleaf mahogany indicate that on good sites this species may prove highly productive. Fifteen-year-old plantations have an average diameter of 6 inches and are growing at the rate of 150 cubic feet per acre. The apparent success of these plantations has been the basis for a recommendation of underplanting of this species on 500 additional acres.

A series of reports was completed by the Central States Station which describe strip-mine conditions and give overburden analyses for the eight coal-mining districts of Ohio. They make available for ready use by forest-land owners and other agencies concerned with rehabilitation of stripped lands in Ohio, summaries of reconnaissance and stratigraphic (arrangement of strata) data. With few exceptions, the most practical use for these lands is growing trees to improve soil conditions and to produce forest products.

Developing superior trees

At the Institute of Forest Genetics in California, Forest Service researchers made important progress on the tree-breeding program. For the first time a sufficient number (21,500) of hybrid pine seedlings has been produced to permit the establishment of a pilot plantation. This plantation included five of the most promising hybrids developed at the institute to date. All but one are crosses with ponderosa pine, the predominant species of pine in the West. Since ponderosa occupies more area than all other western pines, any hybrid improvement is of tremendous significance to western forestry.

Seed farms—the source of hybrid seed—are no longer a matter of wishful thinking. One such farm developed by the institute produced 55,000 sound seed during the past year. This amount of seed is sufficient to reforest 165 acres to hybrid pine at the rate of 1 hybrid to 4 trees from ordinary stock. In this method of mixed planting, the trees from ordinary stock ultimately become thinnings and the hybrids become the final crop.

The first step in shortening the period from the development of a hybrid to the production of hybrid seed has been made. It was accomplished by a grafting technique which permits the union of hybrid seedlings to mature trees. Thus far male flowers have been successfully produced by the grafting procedure. As soon as such graftings result in the production of female flowers the process will be complete. In the meantime, mature trees that are naturally heavy producers of seed are being identified for understock—the trees to which hybrid seedlings are to be grafted.

Still another technique that will speed up hybrid seed production has been developed. It makes possible the immediate germination of seed after maturation. From seed collected in September it is now possible to produce seedlings in December equal to planted stock 1 year old. A chilling treatment now under study is also expected to make it possible to induce a second year's growth and thereby obtain 2 years' growth in 1. Hybrid seedling material for grafting purposes can thus be produced in record time.

A South-wide study of geographic strains of the four major southern pines was started in 1951. It is being spearheaded by the Southern Forest Experiment Station and participated in by a large number of forestry organizations, including the Southeastern Station. The tree planting program in the South, and the short rotation for merchantable products promise to make tree improvement through selection and breeding of superior types a fruitful line of investigation.

Tending existing forests

Bigtooth aspen stands should be harvested by age 50 in northeastern Iowa, according to studies by the Central States Forest Experiment Station. Beyond this age, deterioration and losses become excessive. In recent years a good market has developed in this area for aspen for lumber and veneer and its sale value has increased.

Species suitability is being determined for problem areas in the Northeast. For converting lands now occupied by scrub oak into valuable forests, in the Pocono section of Pennsylvania, red pine is proving to be the best all-around species. On cut-over and burned spruce lands in West Virginia, red pine is again most successful in competing with herbaceous growth, while red spruce can most successfully compete with overtopping shrubs.

The role of fire as a silvicultural agent in the regeneration of pitch pine in southern New Jersey is now well established as a result of studies dating back to 1936 by the Northeastern Forest Experiment Station. Controlled light winter burning helps check hardwoods and provide a favorable seedbed for the pine. In this area as in many other locations where pine is found, the natural succession is to hardwoods. Special measures, of which prescribed burning is only one of several possibilities being tested, are necessary to perpetuate the generally preferred pine.

In the South, hardwood control has now been performed on 292,000 acres of privately owned timberland. Participated in by 27 different companies, this work was designed to favor the growth of the more valuable southern pines and was accomplished chiefly in the 2-year period preceding June 1951. The techniques employed in this comparatively new silvicultural practice stem in large part from research carried on at the Southeastern and Southern Forest Experiment Stations.

A new source of pulpwood is developing in the Lake States in the form of thinnings from almost 1,000,000 acres of red pine and jack pine plantations. To meet increasing demands for tested methods of plantation culture, the Lake States Forest Experiment Station has a number of studies under way. Current emphasis is in lower Michigan, where most of the older Lake States plantations are located.

Spruce trees were pruned to 18 feet at an average cost of less than 15 cents per tree, in a cooperative study by the Northeastern Station and the University of Maine. Pruning at this cost should be a good investment, considering the difference in value between knotty and clear lumber. Cost studies in the Pacific Northwest have demonstrated that crop trees can be pruned to a height of 18 feet in a 40-year-old stand of Douglas-fir for about 25 cents per tree. Open-grown longleaf pine trees in central Louisiana were pruned to 17 feet at a cost of 4 cents per 4-inch tree (diameter breast high) or 8 cents for an 8-inch tree.

Gross volume growth per acre in young ponderosa pine stands in the Southwest is rarely increased through thinning. This conclusion is emerging from 46 study plots established at 6 different locations between 1924 and 1935. As markets develop for small products in the area, however, it still may be possible to get the benefits of increased diameter growth of reserved crop trees and improvement in quality of wood which result from early thinning.

In Puerto Rico, it was found that light improvement cuttings in rain forest result in adequate natural reproduction of some of the better species, making unnecessary the introduction of better species by underplanting. Experimental improvement cuttings in rain forest have also shown that some of the aggressive weed species may be eliminated simply by girdling without the use of poisons if a fairly dense stand is left.

Aerial photographs have been used to locate all remaining relics of virgin forest in Puerto Rico to make possible complete descriptions of these forests before they disappear.

Applying technical principles to forest management

The forests of southeastern Alaska are "climax" forests, that is, in the final, stabilized stage of their natural development. A system of classification for this type of Alaska forest was completed during the year to meet partially the growing need for forest-management knowledge in connection with the expanding use of Alaska's timber. The characteristics of the new classes are distinct as to volumes attained, the proportion of species, the number of logs produced, the number of culls, and gross growth. The classification system will serve to describe a stand prior to logging in sufficient detail that future second growth on the same area can be related to it.

A vigor classification to aid timber markers is now available for mature western white pine. Conducted jointly by the Northern Rocky Mountain Forest and Range Experiment Station and the Bureau of Entomology and Plant Quarantine, work on this project started in 1941. The ability of mature trees to grow and to resist destruction by damaging agents can be predicted with a fair degree of accuracy by the classification system.

A 1951 survey in the Upper Peninsula of Michigan assembled data from 2,600 plots distributed over 65 swamp-forest cuttings. The findings will be helpful in directing future research in the management of the potentially valuable swamp forests. Cooperating with the Lake States Station in this project were private companies, the Michigan Department of Conservation, and local national forests.

Efforts to check the decline of the coffee industry, which by the production of coffee beneath forest shade protects the soil and water resources of 10 percent of the land surface of Puerto Rico, are meeting with some success. A joint study of the variability of coffee yields in which the Tropical Forest Experiment Station is participating has shown that overhead shade intensity is the environmental factor most clearly related to yield of the coffee tree. This finding provides a lead for corrective measures in which forestry will play a prominent part.

An annual growth rate of 600 board feet per acre, worth at least \$12 at current stumpage prices, has been maintained for 13 years following a 1938 thinning in a 100-year-old stand of Douglas-fir. Furthermore, windfall losses following this cutting on the Wind River Experimental Forest in Washington have been negligible. By 1951 the volume of 7,800 board feet per acre removed in the thinning had been entirely replaced through growth, and another cut of approximately the same volume was made.

Naval stores

Chemical pine-gum-stimulation methods, pioneered by the Forest Service at its Olustee Experimental Forest in north Florida, conserved one-quarter million man-days of labor in 1951 with an estimated saving of \$1 million to the industry. Five years' trial shows that treatment with 50-percent sulfuric acid produces greater yields from both slash and longleaf pine than the 40- and 60-percent concentrations originally recommended. The 50-percent concentration is now standard for the gum naval-stores industry and was the only concentration in use last year.

Yields were found to be 12 and 36 percent greater for slash pine and longleaf pine, respectively, when tins (gutters) were nailed on over smooth bark instead of being inserted in the tree with a broad ax, the usual method. The test was conducted on a biweekly schedule of bark chipping and acid application on virgin faces in slash pine, and cutting of yearling faces in longleaf pine. A similar increase in yield occurred in the virgin year in longleaf pine.

Pilot-plant studies in integration of gum production and agriculture on farms revealed some very encouraging possibilities. Under favorable conditions and 1951 price levels, a gum farmer netted 25 cents per tree for the first year of work.

Research in Forest Fire Control

Through its program of forest-fire research, the Forest Service is endeavoring to help reduce the Nation's costs and losses from forest fires, brush fires, and grass fires by the application of modern technology to their control. The technical problems in forest-fire control involve human and other aspects of preventing fires; they concern the weather, the great variety of natural fuels, and the peculiarities of fire behavior. They concern also improvement in the methods, organization, and techniques required to fight fires successfully. Increased knowledge in these fields will make it possible to stretch the fire-control dollar and accomplish more with it.

In addition to the work on research projects the Forest Service prepared some 25 reports or bulletins to make available new information that can be helpful to fire fighters. One of these reports dealt with a 4-year statistical study of 36,000 forest fires in the northern Rocky Mountain region. This report traces the trends that have occurred in the fire problems of that part of the country. It will help greatly in charting the future fire-control program for the region.

A second research publication, that has been in great demand both in this country and in foreign countries, presents the best knowledge developed to date on the behavior of forest fires under different combinations of weather, topography, and fuels. Although this report is based mainly on studies and observations in the northern Rocky Mountain region, most of the information it makes available is significant wherever forest fires are a problem.

Through cooperative arrangements, a study was begun in north Idaho and Montana on the troublesome problem of how to reduce the number of forest fires caused by lightning. With the help of Forest Service fire look-outs, Vincent Schaefer of the General Electric Co., who has been conducting studies in cloud physics, undertook to obtain

time-lapse motion pictures of the build-up of mountain lightning storms. This work may help to determine the possibility of using cloud-seeding techniques to dissipate lightning-bearing clouds.

Range Research

The range-research program of the Forest Service is emphasizing the development of practices that will insure greater values from the country's range resources and so increase livestock production. This program has in mind also the developing of suitable procedures for reseeding ranges to increase forage production and give better livestock gains, and economical methods for reducing undesirable plants. The need for producing more meat for the Nation's growing demands stresses the importance of such developments and their early application.

Forest grazing in the South and Southeast

Liquidation of virgin timber in the southern and southeastern States has left millions of acres of clear cut or very poorly stocked forest land. Much of this land has great potentialities for the production of range forage as well as for future timber production.

Range research conducted in several Southern States has shown that such areas can be profitably utilized for livestock production while being put back into timber production, if livestock grazing and timber growth are closely correlated. In southwest Louisiana, loblolly and longleaf-pine plantations have a grazing capacity of 1 cow-month per acre for a 4-month season, March to June. Grazing capacity declines as the trees grow but rises again when the first thinning is made when the trees are about 15 years old. Additional thinnings at 5-year intervals will salvage weakened and low-grade trees and at the same time enhance the grazing capacity.

Livestock production in pond pine forests of North Carolina has proved feasible and practicable. Cane and palatable browse species on pond pine ranges have a sustained grazing capacity of between one-third and one-half cow-month per acre during the summer season. Establishment and growth of pond pine seedlings are favored by grazing. Disturbance of surface litter by grazing animals enhances the chances for pine seed to reach a suitable spot for germination, and the reduction in competition from other vegetation brought about by grazing is reflected in increased pine seedling growth. Grazing also protects the seedlings from fire damage. Too heavy or unregulated grazing, however, is detrimental both to the forage plants and to the pine seedlings.

Research indicates that wiregrass ranges in the longleaf-slash pine belt in Georgia and northern Florida also can be managed to produce more beef cattle and timber. An allowance of seven acres per cow of upland range freshly burned by carefully conducted prescribed burning, plus 14 acres of unburned upland and 3 to 4 acres of swamp has proved sufficient to carry a cow during spring and summer. Concentrated protein feeds are required to supplement the range forage during the balance of the year. Grazing of the freshly burned-over upland areas does not affect the establishment of pine seedlings. Likewise, it was found that such burning was not detrimental to established

longleaf pine seedlings, although it does kill most of the small slash pine seedlings. Prescribed burning plus regulated grazing in longleaf-slash pine forest lands reduces the hazard of wildfires, increases the production of livestock generally, and permits satisfactory regeneration and growth of pine seedlings.

Utilization of northern Great Plains ranges

Studies conducted on northern Great Plains ranges grazed by cattle near Miles City, Mont., have shown that grazing under moderate stocking varies from year to year, by species, by range subtypes, and with distance from available water. Utilization also varies with stocking and therefore is a good indicator of the rate or level of stocking on a given range. The percentage of plants of important species that is grazed is a good guide to range utilization. Recommended grazing intensities for most summer-range types studied call for utilization of not more than 55 percent of the bluestem wheatgrass plants, 40 to 45 percent of the blue grama plants, 55 to 60 percent of the needle-and-thread plants, 50 to 55 percent of the buffalograss plants, and 50 percent of the threadleaf sedge plants. Slightly heavier grazing of bluestem wheatgrass plants (65 to 75 percent) is permissible on winter ranges and on bottom land types. Winter and summer ranges should be fenced separately and grazed only during the appropriate season.

Reseeding of range land in Montana

Recommended guides to what, where, when, and how to reseed Montana range lands were brought up to date by the Forest Service this year in a revised edition of Farmers' Bulletin No. 1924. Plant species recommended are grouped according to their suitability for the plains, mountain, foothill, and valley ranges. Late fall seeding is ordinarily superior to spring seeding for all species except blue grama, which is best seeded in midspring. Seed of forage species must be covered to insure planting success. Drilling plants the seed to best advantage under most conditions. Dense stands of cheatgrass or other undesirable cool-weather plants must be removed to reduce competition for soil moisture. These recommendations result from several years of research on reseeding techniques. They should furnish the basis for reseeding 3 to 4 million acres of range lands in Montana and adjacent States that are still producing below their potential.

Grazing on reseeded ranges

That moderate or light stocking on range reseeded to crested wheatgrass produces better cattle gains than heavy stocking is indicated by cooperative reseeding and spring grazing studies at Benmore, Utah. For the first 4 years, heavy stocking which utilized 80 percent of the herbage resulted in a gain of 2.05 pounds per day. Moderate stocking which utilized 65 percent of the herbage resulted in 2.70 pounds daily gain; and light stocking, utilizing 50 percent of the herbage, resulted in 2.86 pounds gain. Sagebrush and rabbitbrush are invading the heavily stocked areas. Moderate stocking also gave better protection to the soil than heavy stocking. Movement of the soil, both during heavy rains and during strong winds when the soil was dry, was noticeable on heavily stocked range, but did not occur on the moderately stocked range. Heavy stocking left insufficient protective cover.

Yearling heifers have continued to make good gains on reseeded range at the Manitou Experimental Forest in Colorado, in spite of the dry years in 1950 and 1951. Because of subnormal rainfall the yield of grass on reseeded range areas in 1951 was only one-fifth that of 1948, a year of abundant rainfall. Because of poor growth, the grazing season was also reduced from 176 days in 1948 to 54 days in 1951. Heifers grazing three reseeded experimental areas gained an average of 43 pounds per acre, about half as much as the 81 pounds gained in 1948. But gains on good unseeded range during a similar period in 1951 were only 8.3 pounds per acre. Daily gains during the shortened season on the reseeded range were high, averaging 2.1 pounds per day as compared to 2.0 pounds per day during the comparable season in 1948.

Control of undesirable plants

Studies over a 12-year period in southern Idaho show that planned and controlled burning of big sagebrush can increase forage for livestock. Twelve years after burning, a test area had 98 percent more grazing capacity than adjacent unburned range. Desirable grasses, especially thickspike wheatgrass, provided most of the increase. Big sagebrush, which is unable to sprout, and other woody plants were greatly reduced by the fire, as were the fine bunchgrasses such as Idaho fescue and bluegrass. Bitterbrush was also greatly reduced but recovered part of the loss. In addition to increasing the grazing capacity, removal of the sagebrush by burning made easier the handling of sheep and reduced wool and lamb losses.

Chemical foliage sprays also have proved successful in reducing stands of big sagebrush. In California the butyl ester of 2,4-D resulted in a complete kill when applied on June 30. Time of application is important—the same treatment applied 1 month later produced only a 92-percent kill. The native grass yields increased from 55 pounds per acre before spraying to 589 pounds per acre on sprayed areas where most of the sagebrush was killed.

Near Kamas, Utah, 2,4-D killed 97 percent of the big sagebrush and 40 to 73 percent of the rabbitbrush. Grass production was 180 pounds per acre on the untreated area and 450 to 600 pounds per acre on the sprayed areas. Another area in Utah (Moon Canyon) which had been seeded to crested wheatgrass was invaded by sagebrush and rabbitbrush. Spraying with the ester form of 2,4-D gave a 94-percent sagebrush kill. This kill plus a 91-percent kill of rubber rabbitbrush increased grass production on the range which had been sprayed from 2,350 pounds per acre to 5,700 pounds.

In Wyoming the ester form of 2,4-D and 2,4,5-T both gave good sagebrush kills, 2,4,5-T being slightly superior. Spraying in the early stages of seasonal growth gave best sagebrush kills.

The increased density and vigor of the forage plants on sprayed areas gives better soil protection and furnishes more forage for livestock.

Wyethia, a vigorous perennial weed that is native to mountain summer ranges throughout the West, has increased on many areas, preventing the establishment of good forage plants and causing a loss of grazing capacities. This low-value, undesirable plant prefers moist,

heavy soils and consequently has taken over some of the most productive range sites. Research conducted in Montana and Idaho has proved the practicability of removing this plant from the range by chemical sprays. A solution of 2,4-D in water removed 95 percent or more of the *Wyethia* when applied at the mid- or late-bloom stage. Removal of dense *Wyethia* stands must be followed immediately by reseeding of forage species to prevent soil losses through erosion and reinvasion of the sprayed areas by *Wyethia*.

Improving brush ranges in California

Successful conversion of dense brush areas to productive range in the foothills of California requires careful burning and successful re-seeding, research studies show. In the woodland-shrub type where dense brush previously prevailed, good stands of perennial grasses and some legumes have been obtained by broadcast seeding in the fall, following controlled burning on the better sites. Annuals were seeded on the generally poorer sites. On woodland-shrub areas with an open stand of brush, where there was a good stand of annual grasses before burning, broadcast reseedling was not necessary, as the grass came back quickly. In such situations spot seeding was found to be worth while in local areas of brush thickets.

These studies are carried on with special attention to watershed values. Studies on selected areas have indicated that the greatest effects, in terms of soil losses and down-stream sedimentation, occur on the steeper slopes and less fertile soils. On the gentler slopes and more fertile soils, reseeded burns produce less surface runoff and soil losses, and more forage. Because soil and slope conditions vary so greatly, it is essential that the likelihood of successful conversion to grass and of minimum watershed disturbances be determined in advance wherever possible, in order to avoid unnecessary waste of labor and investment.

Further joint investigations have been started by the Forest Service, the University of California, and the State of California. These will include (1) the classification of brush areas of varying degrees of suitability for conversion to grass, and (2) studies and tests to determine the effects of brush burning on surface runoff and erosion on a wide variety of soils.

It is believed that these investigations will enable livestock operators to save thousands of dollars by concentrating their efforts in localities where the opportunities for establishing grass are likely to be most successful, and where floods, erosion, and sedimentation are least likely to be accelerated.

Forest and Range Influences

Our knowledge of the role of land and its use by man on the control of floods and the improvement of water supplies continues to increase. The Forest Service has gone far enough in its watershed research and flood-control investigations to confirm the principle that the conserving and controlling of the potent water resources of this Nation depend to a large degree on our respect for the land and the care with which we use it.

A highly significant feature of the progress in watershed management, both in research and on the action front, has been the growth of

cooperative activities carried on by a large number of individuals and groups, both in and out of Government. Notable among cooperative groups are the National Association of Soil Conservation Districts, and the American Watershed Council. The latter is a clearing house for many of the 250 or more voluntary community, State, or regional associations organized to promote and expedite joint efforts to place their watersheds in good condition. As these associations come to closer grips with their problems, they are coming to rely increasingly upon the findings from watershed management research on forest and range lands.

Timber harvest methods affect water values

The growing consciousness of water values emphasizes further the necessity for harvesting timber on both public and private lands with due regard to soil and stream flow stability. This trend is accentuated by the rapid acceleration and extension of timber cutting to additional areas on many critical watersheds. It is well known that improperly built and maintained logging roads and skid trails produce soil erosion and muddy runoff. Not so generally known or appreciated are the effects of the methods of cutting or ability of the soil to store water. Studies in the deciduous forests of New York and New England show that repeated clear cutting is followed by a marked decrease in the depth of the humus layer and, in turn, a decrease in its water storage capacity. The humus and top soil layer of well-stocked ungrazed mature timber stands were found to contain two-tenths of an inch more water when the soil was saturated than did the young, understocked stands resulting from clear cutting, and about a half-inch more water at saturation than grazed, uneven-aged stands. Careful forest practices can reduce flood runoff appreciably, especially on shallow soils, by increasing the storage capacity of the soil.

Investigations on the Allegheny Plateau of West Virginia show that erosion and surface runoff caused by log skidding can be greatly reduced by placing simple water bars at calculated intervals along skid roads immediately after logging. Water and soil losses can be reduced still further by so locating and designing skid trails and logging roads as to provide for more effective disposal of runoff water. One important factor in stabilizing the soil is the early development of a plant cover such as weeds, grasses, etc., on the skid roads after the logging is completed.

The relationship of logging to stream flow continues to receive attention in investigations in the Southern Appalachian hardwood forests. Results so far indicate the desirability of a threefold classification of merchantable timber areas: (1) Areas which should not be logged at all under present known methods; (2) areas on which special precautions should be taken in log-road construction and skidding to prevent excessive erosion and runoff; and (3) areas where present provisions for logging appear satisfactory from a watershed point of view. The last classification includes mainly national forest lands where watershed values are already receiving considerable recognition. On many other areas, however, provisions for minimizing watershed damage by logging are still largely lacking. In general, on a Nation-wide basis, the merchantable timber areas which should receive special consideration, irrespective of ownership, would include

(1) slopes and erodible soils subject to heavy rainfall, (2) similar slopes and soils subject to heavy accumulations of snow and excessive spring rains, (3) drier areas, as in the ponderosa pine regions, which are subject to intense summer rainfall.

Special management practices increase water supplies

Previous annual reports have described the progress of research at the Fraser Experimental Forest in Colorado to determine the effects of timber cutting on water yield in areas where most of the precipitation comes as snow. A complete watershed area of 700 acres has now been scheduled for cutting by the strip method over a period of years in order to measure the effects on actual stream flow. Logging roads have already been constructed along the contour and the effects of the openings thus far created are now being investigated to determine increased snow catch, changes in amount of moisture entering the soil, and changes in volume and turbidity of stream flow. Actual timber harvesting will commence after the effects of the roads themselves have been measured. A station publication is being prepared to give results to date of the work at the Fraser Experimental Forest, thus permitting interested people to obtain authoritative information on the findings so far obtained and on the present status of this important research project.

One significant observation that has come out of the study recently is that the maximum accumulation of snow (in terms of water content) is found within the upper portion of the timbered areas rather than on the open spaces above timber line. This finding emphasizes the value of properly designed cutting operations in the coniferous forests at the higher elevations of the Rocky Mountains.

Range land use

Results of investigations of the effects of various intensities of grazing on soil and water losses for three of the major types of livestock range along the eastern slope of the Rocky Mountains in Colorado have permitted a determination of grazing levels which will most nearly assure adequate watershed conditions. These standards, based upon the retention of minimum quantities of cover and litter, expressed in pounds per acre, take into account the variations in rates of water intake and the depth and erodibility of the soils.

Investigations on semiarid range lands in Arizona show that under the climatic and soil conditions which prevail, the quantity of vegetation present makes no significant difference in the yield of water from these areas. Where vegetation is sparse, and especially where the soil is shallow, the savings in water used by grasses are offset by the increased evaporation losses. However, a sparse vegetation gives inadequate protection against accelerated soil erosion and the sedimentation of reservoirs and valley agricultural lands following torrential rains. The studies indicate that protection of the soil by an adequate vegetative cover will in no way deprive downstream water users of any more water than if the vegetation were insufficient to protect the soil.

Growing knowledge of plant-soil-water relations

Studies of variations in the use and storage of soil moisture by forest and other native vegetation in the South Carolina Piedmont confirm

earlier findings on the relation of roots to water yield and flood control, where soils are deep and the climate is wet. For example, the soil under a young stand of loblolly pine was able to store 5.18 inches of rain, and a 40-year-old pine stand 3.51 inches, whereas a field covered with shallow-rooted broomsedge was able to store only 0.11 inch, and a barren area only 0.14 inch. Most of the spring rains ran rapidly off the bare areas and shallow-rooted broomsedge, whereas no surface run-off whatever came from the deep-rooted forest plots.

Experiments in open stands in the Wasatch Mountains of Utah showed that removal of the deep-rooted aspen, but without disturbance of herbaceous cover beneath, reduced transpiration losses to a point where 4 inches more water was made available for stream flow. When the herbaceous cover was also removed, an additional 4 inches of water was made available, but at a cost of 12 tons of soil loss per acre, thus foreboding serious flood and debris hazards to downstream communities.

The influence of roots on the intake and storage of moisture from rains is further substantiated by studies in southeastern Ohio. It was found that in the plots studied the vertical channels in the soil created by living and decaying root systems under a stand of white oak trees amounted to 4,000 per acre down to a depth of 50 inches.

Altogether, it is expected that these studies will throw light on the systems of forest management that will be most likely to influence stream flow in accordance with given objectives of increased water yield or decreased flood peaks, as the case may be.

Expanding cooperative activities and assistance

During the past year the growing interest in basic watershed research was reflected in the release of Senate Document No. 98, Soil and Water Problems and Research Needs of the West. Advice and assistance were furnished to organizations closely concerned with watershed matters such as the American Watershed Council and National Association of Soil Conservation Districts. Special assistance was also given to the Corps of Engineers on soil-moisture problems, and to the State Department (and through it to the United Nations) by representation on an Interagency Committee on International Water Policy. The Geological Survey is now including information in its water bulletins on frost conditions gathered by the Forest Service in the Northeastern States. This information is permitting a more accurate appraisal of flood possibilities since it distinguishes between those types of frost likely to cause rapid flood runoff during the spring snow-melt season and those not likely to do so. It is also calling attention to the importance of selective cutting practices and protection of forest lands from fire and grazing. Forest fires and woods grazing in the Northeast cause conditions that contribute to the formation of types of frost which favor floods.

Forest Economics

Information on the Nation's timber supplies, on the quantities and kinds of wood used in civilian and defense activities, and on prospective future requirements for timber products in relation to prospective timber growth is increasingly needed both for public and private timber-production plans and programs. The Forest Service, through

the Forest Survey authorized by the McSweeney-McNary Act of 1928, collects and interprets basic forestry and economic information bearing on these questions of timber supply and demand.

About 434 million of the 620 million acres of forest land in the United States have been covered by initial forest surveys since 1928. These surveys have obtained specific facts about forest-land areas, timber volumes, and timber growth and drain. About 135 million acres covered prior to 1940 have also been resurveyed to determine the changes resulting from growth on the one hand and drain from logging, fire, insects, and disease on the other.

During fiscal year 1952 initial field surveys covered about 12 million acres of forest land in California, Idaho, New York, Pennsylvania, Maryland, and Ohio. Resurveys of areas previously covered in Washington, Minnesota, Wisconsin, Michigan, Alabama, Georgia, and North Carolina totaled about 20 million acres. Substantial financial or other assistance was contributed by cooperating public and private agencies in 10 of these States. Analytical reports on forest resources were completed for the States of Montana and Florida. Statistical reports were issued for Vermont and Indiana and parts of California, Oregon, Minnesota, New York, and Tennessee.

Equipment requirements study

A national-defense project completed during the year was a study of the requirements of the primary forest-products industries of the United States for equipment, supplies, and manpower. This survey provided a detailed inventory of important items of equipment used during 1950 on commercial logging operations, and at sawmills and certain other wood-using plants; purchases and replacements of equipment and operating supplies; amounts and types of manpower employed in logging; and factors indicating the amounts of equipment, supplies, and manpower used to produce given quantities of timber products within specified periods. The survey showed, for example, that in the lumber industry 57 percent of the logs received in 1950 were obtained from company operations, 36 percent from independent commercial operators, and 7 percent from farmers and other miscellaneous sources. Mechanization is widespread throughout the logging industries, with 70 percent of the felling and bucking operations in the lumber industry and 60 percent in the pulpwood industry performed with power saws. In 1950 loggers owned about 27,000 crawler tractors and 111,000 trucks, and during the year purchased more than 5,000 tractors and 27,000 trucks. About 500,000 workers were employed on commercial logging operations.

In the field of marketing, a study of forest resources and markets in southern Illinois was completed and a report was published suggesting ways in which forests can contribute more to the income of the region through better marketing. Methods for obtaining data on stumpage and log prices were tested to determine the most efficient method for price surveys.

A study of forest-yield taxation was completed. Based on this study, a report, *Forest Yield Taxes*, was published, discussing the principles and applications of the yield tax, specific provisions of yield-tax laws, and the elements of a good yield-tax law.

Forest Products

The forest-products research conducted by the Forest Service is centered at the Forest Products Laboratory in Madison, Wis. The broad objective of this work is to make our forest crop go farther and serve mankind better. During the past year, as has been true in other times of national emergency, a large share of the Laboratory's effort has been aimed at providing the special research and technical services required by the defense agencies and industries in connection with the production, procurement, use, protection, modification, and conversion of forest products. A few examples of the Laboratory's activities follow:

Engineering design of fiber containers

Fundamental research at the Forest Products Laboratory has led to the development of formulas for the design of fiber boxes based on sound engineering principles. The variables in the design formulas include the strength of the fiberboard of which the box is made and the influence of scoring, printing, and similar factors on this strength. With these data and the atmospheric-moisture conditions under which the box is to serve, along with load and stacking requirements, and duration of storage, fiber boxes may now be scientifically designed. Heretofore, it was largely a cut-and-try proposition, often resulting in overstrength with consequent waste of material, or understrength with resulting loss and damage.

Instruction in improved small-sawmill practices

A "package" course, developed by the Forest Products Laboratory, has been made available to those interested in improving efficiency and reducing waste in the operation of small sawmills. This course consists of lecture material and lantern slides showing complete sawing procedure for whole logs. Field trials of the "package" have been enthusiastically received.

Warping of Parana pine

Large quantities of Parana pine are coming into the United States market from South America in the form of wide clear boards. The wood normally has uniform texture and machines smoothly. However, serious warping occurs in some boards. Frequent requests come from industrial users for information on proper methods of kiln drying and on the cause of the warping defect and means for its control. It was determined that the warping is caused by compression wood—abnormal wood formed on the lower side of leaning trees. Publications have been issued which facilitate the detection of compression wood in both rough and planed lumber and make it possible to sort for material free of compression wood.

Unbarked shortleaf pine in sulfate pulping

There are several reasons why it would be desirable to use unbarked wood in pulp production, provided the resulting paper met all use requirements. Costs of bark removal would be eliminated, longer wood storage periods would be possible before the pulpwood would dry to the moisture content at which decay occurs, and larger net yields of pulp might be obtained. Tests were made in which

shortleaf pine chips containing 8, 16, and 24 percent of bark were converted to kraft pulps of the sort suitable for brown wrapping paper, paper bags, and numerous other important uses. Up to 16 percent of bark (10 percent is believed to be a typical amount on pulpwood), the strength of the pulp was as good as that of pulps made from wood with the bark removed. Even with 24 percent of bark, bursting strength of the resulting paper was reduced only 8 percent. On the basis of the tests, an unpeeled cord of wood with 10 percent of bark would yield 5.4 percent more pulp than the same wood if it were peeled.

Instrument for measurement of veneer smoothness

In quality control work on veneers and in evaluating veneer from untried species, it is highly important to be able to make accurate measurements of smoothness. The Laboratory has developed an instrument that measures veneer roughness to the thousandth of an inch.

Color reactions a clue to lignin structure

The problem of determining the chemical make-up or structure of lignin is one which has baffled chemists for 100 years. Since millions of tons of lignin are wasted by chemical wood-processing industries, the answer to this problem is of considerable importance. So far, empirical work on the utilization of lignin has not shown the way to large-scale economical utilization. Fundamental studies on the structure of lignin now under way at the Laboratory have recently provided an initial clue to this difficult problem. Spectroscopic examination of color produced by the action of strong acids on wood has indicated that the color which develops is due in part to a material present in the lignin which can be identified.

Glycerin from wood sugar

A large part of the glycerin produced in this country is a byproduct of the soap-making and fat-splitting industries. The trend toward the use of synthetic detergents to replace soap is reducing the potential source of glycerin. This trend is of considerable concern to the Ordnance Department of the Army, since it affects the supply of one of the primary raw materials for nitration and double-base propellants. This concern has led the Ordnance Department to institute research at the Forest Products Laboratory on the production of glycerin and higher polyhydric alcohols from wood sugars.

Wooden vessel building program

The United States Navy has under way an extensive program for production of wooden vessels. The construction involves the use of laminated structural members. The Laboratory has been actively engaged, during the past year, in research and consultation related to a number of phases of that program. Difficulty in procuring sufficient quantities of white oak dictates consideration of the use of red oak, which must be treated with preservatives. Methods of gluing treated red oak are under study. The larger frames are of such size and form that shipment by common carrier is not feasible and, currently, most frames are being laminated by the shipyards. In order to broaden the base of supply, research is now under way to develop practical methods

of splicing frames made elsewhere and shipped to the yard in sections. The Laboratory, as a service to the Navy, is also conducting qualification tests on frames glued by various processors and, in addition, has acted as a consultant to those processors experiencing gluing difficulties.

Wood use at military installations

At the request of the Army Corps of Engineers, the Laboratory conducted a survey of the procurement, handling, and use of wood at various military installations. This survey disclosed that, in many instances, changes in procurement and handling practices could produce substantial savings to the Government. Among these are purchase of short lengths of lumber where they are suitable; increased use of lower grades; and increased use of thin lumber where specifications permit. To assist in effectuating such procedures, the Laboratory, at the request of the Corps of Engineers, prepared a Manual on Preparation of Requisitions for Lumber and Allied Products. The manual consists essentially of two parts: One gives a detailed explanation of how to prepare requisitions for lumber, plywood, poles, railroad ties, and other materials, so that procurement by the Corps of Engineers will be expedited; and the other, consisting chiefly of tabulated data, sets forth recommended minimum grades of materials for a wide range of military uses including boxes and crates, construction lumber, fencing, communication lines, wharves, and naval vessels. The objectives are to coordinate purchasing and assist requisition writers in selection of suitable grades in order to eliminate waste, reduce costs, and conserve material.

Investigation of hangar failure

By application of accumulated basic research, a Forest Products Laboratory specialist saved the Government nearly \$2,000,000 in connection with a large hangar in which one wood truss had failed. A cost of \$10,000 for replacement of a key wood truss instead of \$2,000,000 for complete replacement of its roof structure (as contemplated before the inspection) resulted from an examination and recommendation by the Forest Products Laboratory engineer. The recommendations on which this saving was based would have been impossible without the core of knowledge resulting from the fundamental research carried on over a period of years at the Laboratory.

A TIMBER RESOURCE REVIEW

The Forest Service this year began work on another periodic summary of the timber-resource situation in the United States. Known as the Timber Resource Review, this summary is the latest of a series of similar appraisals made at 8- to 10-year intervals to collect and interpret current facts of national scope as a basis for reorienting forest policy and making program recommendations. The last similar review of the forest situation was in 1945.

In current planning for this effort, the Forest Service is seeking the advice of State and private forestry agencies, the forest industries, and conservation, farm, and labor organizations. Their assistance is also being sought in determining the facts of the forest situation.

RIVER BASIN DEVELOPMENT AND FLOOD CONTROL

The Forest Service, through representation on the Department of Agriculture field committee, participated in the preparation of a supplemental report for the Missouri River Basin. This report (H. Doc. No. 530, 82d Cong., 2d sess.) emphasizes the need for remedial measures on watershed lands as a means of reducing flood damages.

In the Columbia Basin also, the Forest Service is contributing to the work of a departmental field committee which is preparing a comprehensive agricultural program for the basin, scheduled for completion during 1954.

In the Arkansas-White-Red River Basins and the New England-New York area, comprehensive surveys of water and land resources are being made by inter-agency committees on which the Department of Agriculture is represented. The Forest Service has primary responsibility for developing the forestry and related phases of the water- and land-resources programs and for coordinating and integrating them with other agricultural and nonagricultural programs for these regions.

Flood Control Projects and Surveys

The Forest Service is participating in flood-control projects authorized by Congress in the watersheds of the Coosa (Ga.), Little Tallahatchie (Miss.), Los Angeles (Calif.), Potomac (Va., W. Va., and Md.), Santa Ynez (Calif.), and Yazoo (Miss.) Rivers.

In the Coosa River watershed, improvements and facilities to protect the forests from fire have been installed. Organized protection was extended to several counties previously unprotected. This was accomplished through Federal-State cooperation, the costs being shared by the Federal Government and the State of Georgia. Installation of fire-protection facilities was also progressing in the Potomac River watershed, through Federal-State cooperation.

In the Little Tallahatchie-Yazoo watersheds more than 13½ million trees were planted on privately owned lands and nearly 2½ million on public lands in the project area. Project foresters assisted in the preparation of 959 farm plan agreements. One-third of the woodlands in the watersheds have now been covered by farm plans. The foresters aided 630 landowners on timber-management problems, and during the year 13,000 acres were added to the list of forest lands being managed according to recommended forestry practices. In cooperation with the State of Mississippi fire protection has been extended to all but four counties in the watersheds.

In the mountain area of the Santa Ynez River watershed installation of improvements and facilities for the control of fire is about two-thirds completed. The intensification of protection already has made it possible to suppress quickly many fires that could easily have become major conflagrations.

On one phase of the flood-prevention program for the Los Angeles River watershed the Forest Service is cooperating with the California State Division of Highways on stabilization of mountain-highway slopes. This work has been slowed because of the need for expenditures of State funds on other projects. Road slopes already treated,

however, successfully withstood some severe tests in the rainstorms of January 1952. Where formerly slips and landslides frequently occurred during such storms, the treated slopes held up under the impact of rain and runoff. Road-maintenance costs were thus reduced, and much less sediment was washed into the mountain channels above a flood-control reservoir. Recent rapid expansion of residential construction in the foothill areas of the watershed has aggravated the forest-fire protection problem on the chaparral-covered mountains nearby. Protection is provided in these areas through cooperation between the city and county of Los Angeles and the Forest Service.

During the past year the Department of Agriculture sent the following flood control survey reports to the Congress for its consideration. Each report has been published as a House document.

Watershed	State	H. Doc. No.
Brazos-----	Texas-----	396
Delaware-----	Delaware, New Jersey, Pennsylvania, New York, Maryland.	405
Grand (Neosho)-----	Arkansas, Oklahoma, Missouri, Kansas.	388
Pee Dee-----	South Carolina, North Carolina, Virginia.	395
Queen-----	Arizona-----	397
Sevier-----	Utah-----	406
Scioto-----	Ohio-----	409
Sny-----	Illinois-----	398
Green-----	Kentucky, Tennessee-----	261
Pecos-----	New Mexico, Texas-----	475

Flood-control surveys for 40 additional watersheds have been authorized by Congress, and the work on these surveys is under way. Reports on several of these should be completed and submitted to Congress during the current year. The Forest Service and the Soil Conservation Service cooperate in these surveys and in the preparation of the reports.

DEFENSE ACTIVITIES

As part of the defense production program the Forest Service has supplied the National Production Authority and other defense agencies with varied information on supplies and requirements for timber and wood products. Under this program applications from wood-using plants for Government loans or for accelerated tax amortization of new facilities have been referred to the Forest Service by NPA for appraisals of the adequacy of timber supplies available for the proposed new plant facilities. These investigations have furnished part of the basis for action by the Defense Production Administration in issuing certificates of necessity for new plant construction.

In the first year of the program the Forest Service prepared 250 resource reports on tax and loan applications and during the past year an additional 115 reports. The total of 365 resource appraisals prepared to date cover 280 expansions in the pulp and paper and rayon textile industries, 45 in the veneer and plywood industry, and 40 in

the lumber industry. These applications represent plant facilities valued at about \$1.6 billion, and possible additional drain on timber resources of approximately 13 million cords.

Favorable reports on timber resources were made for many applications located in areas where there is a current or prospective surplus of the kinds of timber required to support plant expansions. In other cases where applicants proposed to draw upon deficit areas where there is a prospective shortage of timber growth, reports were necessarily unfavorable. In still other cases favorable reports were predicated upon observance of specific conditions such as the utilization of hardwoods in lieu of scarce softwoods. In the latter cases, the defense agencies are incorporating such conditions in certificates of necessity.

Other defense activities of the Forest Service have included a variety of special investigations and reports in the field of forestry and forest products. Outstanding among these was the equipment-requirements study described earlier under "Forest Economics."

Closely related to the regular work of the Forest Service have been a number of additional projects conducted for the military and other defense agencies, including photogrammetry studies, research in photo interpretation for military purposes, research on special fire projects, and a wide variety of special investigations in the field of forest products.

FOREST SERVICE PERSONNEL

Recruitment

Although the enrollment in forestry schools declined during the scholastic year 1951-52 due to graduation of veterans who obtained their education under the provision of the GI bill of rights, the number applying for the junior forester civil-service examination resulted in an eligible list adequate to meet the recruitment needs of the Forest Service for the fiscal year 1952. The 1952 junior forester examination was held at an early date, enabling the Forest Service to receive a certification of eligibles in March 1952, and to make offers of employment to qualified senior students before their graduation in June.

As in other years since the end of World War II, the Forest Service had difficulties recruiting needed engineers and stenographers. Except for these two occupational categories the Forest Service has been able to maintain adequate personnel rosters.

Classification

The Forest Service classification review plan, placed in effect in 1949, and adopted by a majority of the regional offices and experiment stations, made it possible to meet expeditiously the recent legislative requirements for periodic review of positions and reporting of numbers and grades of positions.

Two classification training programs were organized and conducted by the Service's Classification Section. A training program specifically designed for administrative officers of six experiment stations was completed on February 1. A 6 weeks' training course for regional classification officers was completed on May 16.

The Forest Service was confronted with numerous problems in the employment of fire fighters and other short-term labor, especially in

the high-wage areas of the west coast, because of the wage freeze in January 1951. Negotiations to obtain Wage Stabilization Board approvals of wage rates in excess of the cost-of-living increases permissible under WSB regulations were necessary in some instances.

Training

At safety and training conferences in Ogden, Utah, Forest Service safety and training officers proposed policies to improve accident prevention and advance training of employees. The policy proposals were approved by the Chief. Better utilization of manpower was the keynote for employee training and development, with emphasis upon improvement of supervision at all levels.

Performance rating

Further improvement in application of the performance-rating plan, adopted in 1951, was made during the current year. For forest ranger and other positions for which job-load analyses, standards of performance, and related work plans exist, the rating plan is tied in directly to these. Examples of written performance requirements for other representative positions of various levels were distributed to the field to aid in putting all requirements into written "finished" form by the end of the year. Emphasis was placed on fuller mutual understanding between supervisor and subordinate as to duties and levels of performance; written notes, at rating time, on the needs for the employee's training and development; written notes similarly, as to existence and nature of weaknesses; and reporting, through channels, any outstanding performance or achievement.

Nineteen Forest Service employees received "outstanding" performance ratings for the year. In addition, 7 Forest Service employees as individuals and 1 Region as a unit received the Department of Agriculture's superior service awards, 34 individuals were granted meritorious promotions and certificates of merit, 41 cash awards were made, and 441 work improvement and employee suggestions were approved.

Retirement

During the fiscal year 91 Forest Service employees retired for age or by option. Their average age was 62.3 years; and they had an average of 30.2 years of service. An additional 49 employees were retired for disability.

STATEMENT OF RECEIPTS AND EXPENDITURES

National forests

Receipts from the national forests deposited to the forest reserve fund amounted to \$69,720,198. In addition there was collected \$1,448,975 from national-forest lands which were within the former indemnity limits of the grants to the Oregon and California Railroad Co., and \$233,338 from Tongass National Forest in Alaska, both of which were deposited in suspense pending proper disposition. Including these amounts, total receipts were \$71,402,511. Of the forest reserve fund receipts, \$63,722,986 was from timber; \$5,022,654 from grazing; and \$974,558 from special land uses, water power, etc. Of the amount credited initially to the forest reserve fund, \$131,588 is

returned to Arizona and New Mexico on account of State school lands within national forests; \$139,999 has been appropriated for acquisition of national-forest lands, and \$14,597 is derived from designated lands in the Superior National Forest for which special payment is made to the State in lieu of the usual 25 percent payment. Of the remaining \$69,434,014, 25 percent, or \$17,358,503, is paid to States for benefit of public schools and public roads of the counties in which national forests are situated; also, 10 percent of the same base amount and of the \$14,597, or \$6,944,861 in all, is appropriated to the Forest Service for roads and trails within national forests. From the remaining balance there is appropriated \$45,006 for payment to Minnesota on account of the designated area in the Superior National Forest and \$310,000 from grazing receipts of various national forests for range improvements on such forests.

Expenditures for national-forest operation, protection, and management were \$41,069,426. Additional expenditures from appropriations for forest roads and trails amounted to \$18,019,291, and for acquisition of national-forest land \$147,031.

Aid to States

Forest Service expenditures for cooperation with States and private agencies in fire control, planting, and assistance in forest practice were \$10,675,182.

Research and miscellaneous

Expenditures for research were \$5,419,643 and for flood control \$1,413,665.

A total of \$7,148,883 was also expended for fire control, slash disposal, improvement work, timber-stand improvement, and other work financed by outside agencies and from receipts authorized to be expended for specified purposes.

Services for other Government agencies from funds advanced or transferred by such agencies amounted to \$1,858,006, including \$110,925 for the Department of the Interior, \$1,034,752 for the Army, \$208,254 for the Navy, \$168,519 for the Department of Commerce, \$127,984 for the Production and Marketing Administration (Agriculture), \$78,407 for Defense Production, and \$129,165 for other agencies.

Total net expenditures were \$85,751,127. In addition, expenditures for which appropriations were reimbursed amounted to \$5,247,235 and expenditures from proceeds of sale of parts and equipment purchased in prior years \$383,584. Expenditures were accounted for by objective and functional classifications under 104 separate appropriation titles.

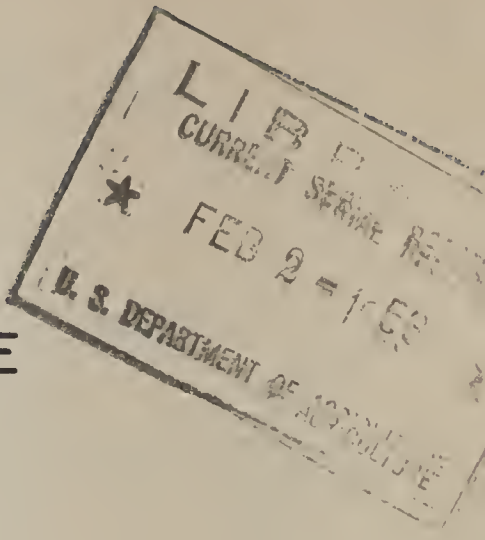
The Forest Service handled the naval stores conservation program, involving payment to farmers of \$425,649 from funds of the Production and Marketing Administration.

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STATISTICAL SUPPLEMENT

REPORT OF THE CHIEF
OF THE FOREST SERVICE

1952



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Table 1. - AREAS WITHIN NATIONAL FORESTS AND OTHER PROJECTS
ADMINISTERED BY THE FOREST SERVICE
JUNE 30, 1952

States	Gross Area Within Unit Boundaries	National Forest Lands, ^{a/} and other lands under Forest Service Adminis- tration
	Acres	Acres
Alabama	2,435,748	620,728
Arizona	12,159,651	11,484,949
Arkansas	3,596,746	2,361,520
California	25,078,194	19,939,420
Colorado	15,232,996	13,728,899
Florida	1,244,229	1,075,250
Georgia	1,732,322	664,326
Idaho	21,569,943	20,275,992
Illinois	812,654	220,895
Indiana	784,647	117,106
Iowa	218,671	4,749
Kentucky	1,411,699	457,178
Louisiana	1,274,977	560,685
Maine	878,283	49,128
Maryland	4,318	1,110
Massachusetts	1,651	1,651
Michigan	5,161,057	2,555,936
Minnesota	5,041,660	2,677,072
Mississippi	2,777,325	1,048,676
Missouri	3,459,999	1,355,307
Montana	19,015,176	16,562,655
Nebraska	207,209	206,028
Nevada	5,378,726	5,057,733
New Hampshire	802,714	677,174
New Mexico	10,279,550	9,009,893
North Carolina	3,592,436	1,114,044
North Dakota	764,425	520
Ohio	1,466,029	103,842
Oklahoma	344,269	180,717
Oregon	17,378,050	14,816,899
Pennsylvania	743,999	471,422
South Carolina	1,423,339	586,961
South Dakota	1,403,357	1,115,412
Tennessee	1,532,124	591,275
Texas	1,716,965	658,079
Utah	9,009,452	7,881,216
Vermont	629,004	225,186
Virginia	4,017,962	1,442,457
Washington	10,746,707	9,683,223
West Virginia	1,832,868	903,322
Wisconsin	2,023,858	1,461,716
Wyoming	<u>9,016,134</u>	<u>8,567,103</u>
Total - States	208,201,123	160,517,454
Territories		
Alaska	20,777,547	20,742,762
Puerto Rico	<u>186,182</u>	<u>33,113</u>
Total - Territories	20,963,729	20,775,875
Grand Total	229,164,852	181,293,329

^{a/} Includes land utilization projects and other special areas administered by the Forest Service, and 147,565 acres in the process of acquisition for national forest purposes. Does not include 446,137 acres of land utilization project land under Forest Service custodianship but leased to states or state agencies, or administrative sites outside national forest boundaries reserved from the public domain.

Table 2a. - CONSTRUCTION, RECONSTRUCTION, AND MAINTENANCE OF NATIONAL FOREST ROADS AND TRAILS, BY STATES

Fiscal Year 1952

States	Roads					Trails					Total Obligations
	Miles		Obligations			Miles		Obligations			
	Construction and Recon- struction	Mainten- ance	Construction and Recon- struction	Maintenance	Total	Construction and Recon- struction	Mainten- ance	Construction and Recon- struction	Maintenance	Total	
	Miles	Miles	Dollars	Dollars	Dollars	Miles	Miles	Dollars	Dollars	Dollars	Dollars
Alabama . . . . .	..	706.5	54,170	79,385	133,555	..	..	..	..	..	133,555
Alaska	3.9	75.5	31,882	18,028	49,910	2.1	750.2	8,814	87,186	96,000	145,910
Arizona	8.0	7,362.1	309,342	289,869	599,211	..	3,696.4	423	24,781	25,204	624,415
Arkansas	10.5	2,276.6	39,202	264,894	304,096	..	..	..	..	..	304,096
California	17.3	13,780.5	1,645,372	1,571,170	3,218,542	3.0	16,678.0	31,259	404,648	435,907	3,652,449
Colorado	30.4	2,837.5	123,641	212,522	336,163	11.5	9,841.4	21,500	53,831	75,331	411,494
Florida	10.0	1,615.0	27,580	123,620	151,200	..	..	..	..	..	151,200
Georgia . . . . .	..	537.8	12,325	88,029	100,354	..	182.9	..	1,434	1,434	101,788
Idaho	22.5	7,688.5	1,364,167	546,744	1,910,911	..	22,838.0	52,164	344,989	397,153	2,308,064
Illinois	0.5	151.3	8,999	58,789	67,788	..	..	..	..	..	67,788
Indiana . . . . .	..	15.3	21	2,033	2,054	..	..	..	..	..	2,054
Kentucky	2.1	355.6	27,161	54,273	81,434	..	4.2	..	..	..	81,434
Louisiana	1.7	455.4	59,796	82,955	142,751	..	..	..	- 13	- 13	142,738
Maine . . . . .	..	20.9	119	2,743	2,862	..	61.0	..	778	778	3,640
Maryland . . . . .	..	..	..	..	..	..	..	..	..	..	..
Michigan	4.0	1,435.5	61,755	100,561	162,316	..	..	..	..	..	162,316
Minnesota	4.4	1,044.4	171,930	115,852	287,782	..	485.4	..	10,920	10,920	298,702
Mississippi	1.7	932.7	49,077	182,440	231,517	..	..	..	..	..	231,517
Missouri . . . . .	..	797.8	2,836	141,734	144,570	..	..	..	..	..	144,570
Montana	34.3	5,040.0	394,771	373,239	768,010	5.0	16,489.0	14,204	346,342	360,546	1,128,556
Nebraska . . . . .	..	239.5	..	11,032	11,032	..	..	..	54	54	11,086
Nevada	23.9	734.6	13,642	59,528	73,170	..	1,739.0	- 112	8,577	8,465	81,635
New Hampshire	0.5	101.2	12,778	42,927	55,705	..	744.6	..	15,213	15,213	70,918
New Mexico	23.0	6,070.2	66,594	219,550	286,144	..	3,641.0	..	27,668	27,668	313,812
North Carolina	8.0	588.3	199,502	132,094	331,596	..	965.0	..	5,734	5,734	337,330
Ohio . . . . .	..	11.6	- 8	6,047	6,041	..	..	..	..	..	6,041
Oklahoma	0.5	151.7	8,737	16,446	25,183	..	..	..	..	..	25,183
Oregon	40.7	9,613.8	1,816,482	714,980	2,531,462	16.5	13,377.3	21,915	181,425	203,340	2,734,802
Pennsylvania . . . . .	..	187.5	- 273	44,504	44,231	..	166.9	..	846	846	45,077
Puerto Rico	1.0	23.9	29,193	18,064	47,257	..	31.4	..	3,685	3,685	50,942
South Carolina	22.8	844.4	82,937	82,722	165,659	..	..	..	..	..	165,659
South Dakota	7.1	1,065.4	21,956	89,663	111,619	..	15.7	..	1,803	1,803	113,422
Tennessee	6.0	550.5	14,013	112,208	126,221	..	465.9	..	1,692	1,692	127,913
Texas	27.6	760.5	73,454	127,494	200,948	..	..	..	..	..	200,948
Utah	11.5	3,114.9	72,420	183,665	256,085	..	7,364.0	-2,150	40,368	38,218	294,303
Vermont	1.3	85.9	28,072	35,697	83,769	25.0	171.0	2,895	3,533	6,428	70,197
Virginia	2.0	518.9	68,758	113,605	182,361	..	809.7	- 496	3,300	2,804	185,165
Washington	7.0	3,624.6	621,288	395,089	1,016,377	53.3	10,189.5	99,669	169,243	268,912	1,285,289
West Virginia	6.1	584.3	73,155	93,170	166,325	..	790.1	..	3,251	3,251	169,576
Wisconsin	3.6	964.1	75,589	70,858	146,447	..	..	..	..	..	146,447
Wyoming	4.0	2,088.7	50,496	121,754	172,250	..	5,864.2	8,597	41,521	50,118	222,368
Total	347.9	78,853.2	7,712,931	8,999,777	14,712,708	116.4	117,361.8	258,682	1,782,809	2,041,491	16,754,199

Table 2b. - CLASSIFICATION OF MILEAGE IN FOREST ROAD AND TRAIL SYSTEM, AND EXPENDITURES REQUIRED TO COMPLETE THE SYSTEM TO A SATISFACTORY STANDARD, JUNE 30, 1952.

Total	Satisfactory Standard	Unsatisfactory Standard	Non-existing	Expenditure Required to Complete
Miles	Miles	Miles	Miles	Dollars
Forest Development Roads 149,026.0	63,502.8	46,895.5	38,627.7	\$867,372,384
Trails 125,349.8	92,788.3	26,845.0	5,916.5	11,863,645
Total 274,375.8	156,291.1	73,540.5	44,544.2	\$879,236,029

Table 3 . - QUANTITY AND VALUE OF TIMBER CUT ON THE NATIONAL FORESTS, BY STATES

FISCAL YEAR 1952

STATE	QUANTITY OF TIMBER CUT			VALUE OF TIMBER CUT		
	Sales	Land Exchanges	Total	Sales	Land Exchanges	Total
	MBM	MBM	MBM	Dollars	Dollars	Dollars
Alabama	42,210	..	42,210	695,385	..	695,385
Alaska.	61,892	..	61,892	181,270	..	181,270
Arizona	186,536	..	186,536	1,724,188	..	1,724,188
Arkansas. . . .	64,283	65	64,348	1,886,035	3,605	1,889,640
California. . .	612,694	54,774	667,468	11,694,414	387,296	12,081,710
Colorado. . . .	119,040	6,624	125,664	415,575	39,629	455,204
Florida	40,883	1,796	42,679	365,115	6,470	371,585
Georgia	26,265	505	26,770	412,268	13,448	425,716
Idaho	259,725	1,391	261,116	2,629,614	5,656	2,635,270
Illinois. . . .	3,039	151	3,190	39,490	4,350	43,840
Indiana	727	..	727	5,900	..	5,900
Kentucky. . . .	14,696	..	14,696	148,012	..	148,012
Louisiana . . .	36,214	..	36,214	492,330	..	492,330
Maine	2,407	..	2,407	24,546	..	24,546
Michigan. . . .	78,912	1,403	80,315	594,307	4,282	598,589
Minnesota. . .	109,767	15,161	124,928	522,069	43,780	565,849
Mississippi . .	100,844	..	100,844	1,478,713	..	1,478,713
Missouri. . . .	23,293	1,244	24,537	132,024	8,902	140,926
Montana	221,731	5,474	227,205	1,429,641	30,535	1,460,176
Nebraska. . . .	4	..	4	20	..	20
Nevada.	470	..	470	1,550	..	1,550
New Hampshire .	14,087	..	14,087	112,962	..	112,962
New Mexico. . .	55,403	1,713	57,116	418,231	9,043	427,274
North Carolina.	35,737	254	35,991	424,966	8,549	433,515
Ohio.	599	..	599	5,230	..	5,230
Oklahoma. . . .	819	..	819	2,062	..	2,062
Oregon.	1,072,262	82,907	1,155,169	18,810,768	420,454	19,231,222
Pennsylvania. .	7,073	..	7,073	122,402	..	122,402
Puerto Rico . .	521	..	521	9,202	..	9,202
South Carolina.	32,046	..	32,046	742,843	..	742,843
South Dakota. .	33,405	..	33,405	268,276	..	268,276
Tennessee . . .	20,489	621	21,110	249,996	9,845	259,841
Texas	83,605	..	83,605	1,696,013	..	1,696,013
Utah.	31,344	1,603	32,947	142,533	10,670	153,203
Vermont	14,002	420	14,422	150,738	4,933	155,671
Virginia. . . .	21,578	..	21,578	181,957	..	181,957
Washington. . .	676,838	8,765	685,603	9,257,105	42,891	9,299,996
West Virginia .	14,957	..	14,957	157,267	..	157,267
Wisconsin . . .	61,973	1,233	63,206	430,098	10,751	440,849
Wyoming	49,749	307	50,056	219,805	1,200	221,005
Totals - 1952	4,232,119	186,411	4,418,530	58,274,920	1,066,289	59,341,209*
Totals - 1951	4,421,800	266,480	4,688,280	46,532,531	1,283,858	47,816,389*

*In addition, forest products not convertible into board feet were cut, the value of which was \$192,947 in 1952 and \$177,578 in 1951.

Table 4. - FOREST TREE PLANTING AND SOWING ON THE NATIONAL FORESTS, BY STATES

FISCAL YEAR 1952

State	Acres Planted and Seeded ^{1/}				
	Fiscal Year 1952	Previous Years	Total to Date	Lost From All Causes	Net Total to Date
Alabama	788	39,538	40,326	2,680	37,646
Arizona	383	658*	1,041	260	781
Arkansas	157	14,373	14,530	4,900	9,630
California	6,791	36,807***	43,598	11,930	31,668
Colorado	460	66,890	67,350	28,503	38,847
Florida	440	9,381	9,821	765	9,056
Georgia	400	3,096	3,496	57	3,439
Idaho	1,666	96,653	98,319	26,486	71,833
Illinois	990	29,888	30,878	1,522	29,356
Indiana	539	9,939	10,478	545	9,933
Kentucky	72	401	473	..	473
Louisiana	351	98,219	98,570	21,170	77,400
Maine . . . . .	..	67	67	..	67
Michigan	5,359	525,785	531,144	152,540	378,604
Minnesota	1,976	124,545	126,521	31,874	94,647
Mississippi	1,885	130,343	132,228	4,776	127,452
Missouri	2,511	54,666	57,177	12,931	44,246
Montana	754	33,992	34,746	12,995	21,751
Nebraska	140	29,546	29,686	12,755	16,931
Nevada	12	63****	75	34	41
New Hampshire . . . . .	..	1,153	1,153	145	1,008
New Mexico	38	1,004**	1,042	999	43
North Carolina	506	5,763	6,269	345	5,924
Ohio	483	6,284	6,767	864	5,903
Oklahoma . . . . .	..	57	57	57	..
Oregon	11,251	55,906	67,157	5,575	61,582
Pennsylvania	75	16,918	16,993	4,698	12,295
Puerto Rico	179	11,373	11,552	8,220	3,332
South Carolina	1,169	14,795	15,964	231	15,733
South Dakota	574	28,232	28,806	6,310	22,496
Tennessee	496	2,915*****	3,411	243	3,168
Texas	185	48,581	48,766	12,099	36,667
Utah . . . . .	..	3,992	3,992	2,368	1,624
Vermont	32	1,275	1,307	..	1,307
Virginia	152	1,655	1,807	423	1,384
Washington	6,165	86,647*****	92,812	10,000	82,812
West Virginia	119	15,351	15,470	732	14,738
Wisconsin	2,118	217,792	219,910	51,034	168,876
Wyoming	420	5,899	6,319	3,346	2,973
Totals	49,636	1,830,442	1,880,078	434,412	1,445,666

*Adjustment (-375 acres previous years)

**Adjustment (-999 acres previous years)

***Adjustment (/21 acres previous years)

****Adjustment (/21 acres previous years)

*****Adjustment (/175 acres previous years)

*****Adjustment (/210 acres previous years)

^{1/} Includes States where there was some direct seeding as follows:

State	Acres Seeded F.Y. 1952
Florida	257
Idaho	1
Louisiana	218
Minnesota	10
Mississippi	500
Montana	11
North Carolina	9
Oregon	2,200
South Dakota	90
Washington	1,185
Wyoming	59
Total Seeding	4,540

TABLE 5 - PAY PERMITS ISSUED AND NUMBERS OF LIVESTOCK PERMITTED
TO GRAZE UNDER PAY PERMITS ON THE NATIONAL FORESTS, BY STATES,
CALENDAR YEAR 1951

State	Cattle and Horses		Sheep and Goats	
	Permits Issued	Number Allowed	Permits Issued	Number Allowed
Alabama	1	20	..	..
Arizona	825	132,930	26	86,162
Arkansas	182	2,271	..	..
California	1,236	104,401	86	121,599
Colorado	1,801	152,035	521	606,599
Florida	28	3,152	..	..
Idaho	1,952	105,634	382	605,653
Illinois	27	207	1	8
Indiana	11	51	..	..
Iowa	11	199	..	..
Louisiana	30	1,287	..	..
Michigan	136	1,718	3	227
Minnesota	44	514	..	..
Mississippi	52	1,016	..	..
Missouri	422	3,029	..	..
Montana	1,691	113,185	164	255,521
Nebraska	54	13,222	..	..
Nevada	273	53,828	45	128,546
New Mexico	1,761	75,014	163	93,137
North Carolina	25	71	..	..
North Dakota	1	5	..	..
Ohio	34	147	..	..
Oklahoma	4	18	..	..
Oregon	858	69,094	108	149,701
Pennsylvania	11	43	..	..
South Carolina	21	315	..	..
South Dakota	615	23,652	23	15,183
Tennessee	11	100	..	..
Texas	74	2,226	..	..
Utah	3,330	104,463	751	481,091
Vermont	11	92	..	..
Virginia	15	166	5	169
Washington	454	18,564	29	39,965
West Virginia	97	1,117	39	1,427
Wisconsin	25	293	..	..
Wyoming	1,004	104,253	237	427,824
Totals	17,127	1,088,332	2,583	3,012,812

Table 6 - ESTIMATE OF BIG GAME ANIMALS ON
NATIONAL FORESTS

SUMMARY BY STATES

As of June 30, 1951

State	Antelope Number	Bear		Deer			Elk Number	Moose Number	Mountail Goat Number	Bighorn Number	Peccary Number	Wild Boar Number	Total Big Game Number
		Black Number	Grizzly and Alaska Brown Number	Whitetail Number	Mule Number	Blacktail Number							
Alabama	..	10	..	2,400	..	..	..	..	..	..	..	..	2,400
Arizona	5,800	1,000	..	14,000	62,000	..	8,600	..	..	65	13,000	..	104,000
Arkansas	..	20	..	13,000	..	..	300	..	..	..	..	..	13,000
California	3,000	17,000	..	..	290,000	169,000	100	..	..	480	..	400	480,000
Colorado	160	6,900	10	..	243,000	..	33,000	..	20	3,600	..	..	287,000
Florida	..	550	..	9,200	..	..	..	..	..	..	..	..	9,800
Georgia	..	60	..	4,500	..	..	..	..	..	..	..	..	4,600
Idaho	8,000	8,900	40	21,000	141,000	..	43,000	1,800	3,900	2,400	..	..	230,000
Illinois	..	..	..	550	..	..	..	..	..	..	..	..	550
Indiana	..	..	..	1,500	..	..	..	..	..	..	..	..	1,500
Kentucky	..	10	..	300	..	..	..	..	..	..	..	..	310
Louisiana	..	5	..	1,500	..	..	..	..	..	..	..	..	1,500
Maine	..	20	..	800	..	..	..	10	..	..	..	..	830
Michigan	..	3,000	..	206,000	..	..	..	..	..	..	..	..	209,000
Minnesota	..	4,500	..	61,000	..	..	..	500	..	..	..	..	66,000
Mississippi	..	20	..	6,300	..	..	..	..	..	..	..	..	6,300
Missouri	..	..	..	17,000	..	..	..	..	..	..	..	..	17,000
Montana	3,100	7,000	580	39,000	110,000	..	34,000	3,800	3,900	1,200	..	..	203,000
Nebraska	..	..	..	10	450	..	..	..	..	..	..	..	460
Nevada	530	45	..	..	78,000	..	500	..	..	100	..	..	79,000
New Hampshire	..	320	..	1,600	..	..	..	10	..	..	..	..	1,900
New Mexico	2,100	1,300	..	6,200	53,000	..	2,100	..	..	140	580	..	65,000
North Carolina	..	640	..	11,000	..	..	..	..	..	..	..	320	12,000
Ohio	..	..	..	550	..	..	..	..	..	..	..	..	550
Oklahoma	..	5	..	400	..	..	..	..	..	..	..	..	400
Oregon	1,300	7,200	..	30	160,000	41,000	29,000	..	5	..	..	..	238,000
Pennsylvania	..	300	..	48,000	..	..	..	..	..	..	..	..	48,000
South Carolina	..	15	..	2,100	..	..	..	..	..	..	..	..	2,100
South Dakota	3,000	..	..	42,000	16,000	..	370	..	300	..	..	..	62,000
Tennessee	..	250	..	5,000	..	..	..	..	..	..	..	650	5,900
Texas	..	..	..	6,500	..	..	..	..	..	..	..	..	6,500
Utah	300	480	..	..	195,000	..	5,000	10	..	..	..	..	201,000
Vermont	..	500	..	9,000	..	..	..	..	..	..	..	..	9,500
Virginia	..	1,700	..	29,000	..	..	50	..	..	..	..	..	31,000
Washington	..	11,000	20	8,900	60,000	22,000	17,000	2	5,600	..	..	..	125,000
West Virginia	..	500	..	22,000	..	..	..	..	..	..	..	..	22,000
Wisconsin	..	1,400	..	103,000	..	..	..	..	..	..	..	..	104,000
Wyoming	1,400	2,900	150	6,000	51,000	..	35,000	3,300	..	2,200	..	..	102,000
TOTAL UNITED STATES	29,000	77,000	800	690,000	1,460,000	232,000	208,000	9,400	14,000	10,000	14,000	1,400	2,750,000
Alaska	..	14,000	6,000	..	..	31,000	250	660	6,500	520	..	..	59,000
TOTAL ALL NATIONAL FORESTS	29,000	91,000	6,800	690,000	1,460,000	263,000	208,000	10,000	20,000	11,000	14,000	1,400	2,810,000

* Totals have been rounded off to nearest hundred or thousand.

Table 7 - NUMBER OF VISITS TO THE NATIONAL FORESTS FOR UTILIZATION OF THE RECREATION RESOURCES

CALENDAR YEAR 1951

State	Utilization of Recreation Resources									
	Utilization of Improved Public Recreation Areas				Organi- zation Camps	Hotels or Resorts	Recrea- tion Resi- dences	Wilder- ness Areas	Other Forest Areas	Total
	Camp Grounds	Picnic Areas	Winter Sports Areas	Sub- total						
	Number Visits	Number Visits	Number Visits	Number Visits	Number Visits	Number Visits	Number Visits	Number Visits	Number Visits	Number Visits
Alabama . . . . .	..	38,990	..	38,990	2,450	..	..	..	44,200	85,640
Alaska	1,225	24,486	7,380	33,091	689	1,020	17,115	..	78,365	130,280
Arizona	140,900	400,850	11,570	553,320	13,425	69,055	12,010	27,712	437,484	1,113,006
Arkansas	44,500	177,550	..	222,050	13,350	158,700	3,000	..	128,600	525,700
California	1,100,379	615,981	434,755	2,151,115	160,297	223,600	272,393	107,246	1,146,561	4,061,212
Colorado	412,045	698,045	436,030	1,546,120	10,780	555,875	30,790	13,660	704,050	2,861,275
Florida	27,750	239,400	..	267,150	55,000	1,000	9,100	..	172,501	504,751
Georgia	46,180	233,450	..	279,630	6,300	..	2,300	..	343,500	631,730
Idaho	283,088	232,035	150,036	665,159	13,400	51,433	24,520	17,793	457,632	1,229,937
Illinois	250	104,700	..	104,950	..	..	..	..	139,330	244,280
Indiana	150	34,100	..	34,250	..	..	..	..	61,100	95,350
Kentucky . . . . .	..	16,620	..	16,620	300	..	..	..	66,950	83,870
Louisiana . . . . .	..	38,250	..	38,250	..	..	3,550	..	3,370	45,170
Maine	450	4,300	..	4,750	..	700	..	..	4,800	10,250
Michigan	34,753	88,750	61,400	184,903	8,255	2,200	1,565	..	672,825	869,748
Minnesota	38,813	55,063	19,220	113,096	5,130	35,805	13,526	47,230	383,030	597,817
Mississippi	3,500	58,000	..	61,500	..	..	..	..	145,800	207,300
Missouri	9,142	69,008	..	78,150	740	..	..	..	376,820	455,710
Montana	126,785	198,770	32,730	358,285	15,292	58,460	62,453	13,110	457,261	964,861
Nebraska . . . . .	..	26,000	..	26,000	..	..	..	..	3,000	29,000
Nevada	37,033	47,340	1,270	85,643	2,200	..	650	..	34,400	122,893
New Hampshire	20,402	80,530	42,650	143,582	..	125,000	..	100	277,900	546,582
New Mexico	62,784	452,110	19,795	534,689	7,455	1,770	3,770	6,290	356,614	910,588
North Carolina	143,285	593,940	..	737,225	3,730	197,250	700	25,000	475,540	1,439,445
Ohio	35,000	156,200	..	191,200	..	..	..	..	11,500	202,700
Oklahoma . . . . .	..	9,400	..	9,400	..	..	..	..	6,500	15,900
Oregon	462,750	465,020	249,980	1,177,750	23,475	283,170	28,284	15,860	379,615	1,908,154
Pennsylvania	6,000	90,000	..	96,000	2,000	13,500	8,000	..	765,500	885,000
Puerto Rico . . . . .	..	49,266	..	49,266	3,120	22,256	7,100	..	17,500	99,242
South Carolina	30	114,750	..	114,780	..	..	..	..	72,250	187,030
South Dakota	42,400	253,675	100	296,175	7,350	5,600	12,700	50	910,375	1,232,250
Tennessee	16,000	211,200	..	227,200	5,800	26,750	13,000	..	821,000	1,093,750
Texas	11,400	97,200	..	108,600	2,000	..	..	..	48,600	159,200
Utah	411,795	1,710,662	196,855	2,319,312	51,010	67,880	38,164	12,100	647,597	3,136,063
Vermont	850	42,500	..	43,350	..	..	..	..	28,400	71,750
Virginia	5,111	195,857	..	200,968	2,040	..	225	..	125,900	329,133
Washington	460,744	443,800	229,019	1,133,563	41,212	90,170	43,121	2,584	288,935	1,599,585
West Virginia	7,812	132,188	..	140,000	2,165	..	..	..	158,523	300,688
Wisconsin	11,595	59,850	7,450	78,895	2,620	120	1,170	..	173,500	256,305
Wyoming	135,965	109,505	29,030	274,500	16,875	142,360	26,967	23,650	222,755	707,107
Total	4,140,866	8,669,341	1,929,270	14,739,477	478,460	2,133,674	636,173	312,385	11,650,083	29,950,252

Note: In addition to the 29,950,252 visits to national forest recreation areas, some 65 million traveled highways and roads through the national forests in order to enjoy the natural forest environment, the scenery, and the climatic relief which the altitude and forest provide.

Table 8 - FIRES CONTROLLED BY NATIONAL FOREST FIRE ORGANIZATIONS TO PROTECT THE NATIONAL FOREST LANDS

CALENDAR YEAR 1951, AND
5-YEAR AVERAGE, 1947-1951

Item	Number of fires		Percentage of Totals	
	1951	Average 1947-51	1951	Average 1947-51
Class of Burns:				
0.25 acres or less.....	5,542	5,320	53.37	51.57
0.251 to 10 acres.....	3,519	3,568	33.89	34.58
Over 10 acres.....	1,324	1,429	12.74	13.85
Total.....	10,385	10,317	100.00	100.00
Causes:				
Lightning.....	4,940	4,554	47.57	44.14
Man-caused:				
Smokers.....	1,608	1,828	15.49	17.72
Incendiarism.....	1,663	1,623	16.01	15.73
Debris burning.....	543	534	5.23	5.18
Campfire.....	515	564	4.96	5.47
Railroad.....	213	280	2.05	2.71
Lumbering.....	217	185	2.09	1.79
Miscellaneous.....	686	749	6.60	7.26
Total, man-caused.....	5,445	5,763	52.43	55.86
Grand Total.....	10,385	10,317	100.00	100.00
Calendar Year	Total area of national forest land burned over		Total damage of national forest land burned over	
	Acres		Dollars	
1951.....	314,606		11,515,660	
5-year average 1947-51.....	208,621		4,990,046	

Table 9.-NET CASH RECEIPTS FROM NATIONAL FORESTS

FISCAL YEAR 1952

Net receipts from national forests:

From timber	\$63,722,985.58 ^a	
From forage	5,022,654.28	
From special lands uses, water power, etc.	<u>974,557.73</u>	
Total		<u>\$69,720,197.59</u> ^{b,c}

Distribution of above total:

1. Amount appropriated for acquisition of lands
in the following National Forests:

Forest	
Angeles	\$20,000.00
Caohe	10,000.00
Cleveland	8,435.22
Nevada	2,256.89
San Bernardino	16,884.12
Sequoia	34,850.00
Toiyabe	7,743.11
Uinta	26,447.48
Wasatch	<u>13,382.52</u>

Total appropriated for land acquisition	139,999.34
2. Payments to Arizona and New Mexico, account school lands administered by Forest Service	131,587.59
3. Payment to State of Minnesota representing 3/4 of 1 percent of appraised value of national forest land in Cook, Lake and St. Louis Counties under Act of June 22, 1948 (62 Stat. 568)	45,005.57
4. Payments to States in which national forests are located, under Acts of May 23, 1908 and March 1, 1911, as amended	17,358,503.45 ^d
5. Amount appropriated for expenditure by Forest Service for improvement of the range under section 12 of the Act of April 24, 1950	310,000.00
6. Amount appropriated for expenditure by Forest Service for Roads and Trails, under Act of March 4, 1913	6,944,861.07
7. Net amount to United States Treasury	<u>44,790,240.57</u>
Total	<u>\$69,720,197.59</u>

^a In addition to the cash receipts from timber, there should be credited the value of the timber cut under specific agreements for effecting land exchanges, estimated at \$1,066,289.00.

^b This total exceeds the receipts for the previous year by \$13,572,855.74. Receipts from timber increased \$12,624,420.47; grazing increased \$857,080.89; and miscellaneous increased \$91,354.38.

^c Additional receipts, from the sale of timber, are being held in suspense pending determination of the status of the lands from which such receipts were derived as follows:

Oregon and California Railroad Grant Lands	\$1,448,975.44
Tongass National Forest, Alaska	<u>233,338.06</u>
Total	\$1,682,313.50

^d Computed on the basis of total receipts after deduction of (a) 1 and 2 above and (b) \$14,596.86 collected in the counties of Cook, Lake, and St. Louis in the Superior National Forest, State of Minnesota to which the Act of May 23, 1908 does not apply.

Table 10. - PREVENTION AND SUPPRESSION EXPENDITURES FOR FOREST FIRE CONTROL
ON STATE AND PRIVATE FOREST LANDS, BY STATES
FISCAL YEAR 1952

(Clarke-McNary Law, Act of June 7, 1924)

STATE	EXPENDITURES			
	Federal Participation	State and County	Private Agencies	Total
	Dollars	Dollars	Dollars	Dollars
Alabama	312,268	607,457	93,338	1,013,063
Arkansas	253,888	506,953	78,148	838,989
California	1,527,980	5,054,585	—	6,582,565
Colorado	25,712	51,130	47,197	124,039
Connecticut	45,865	90,524	—	136,389
Delaware	8,433	8,434	—	16,867
Florida	529,357	1,008,924	142,838	1,681,119
Georgia	435,198	1,802,526	55,575	2,293,299
Hawaii	4,199	5,419	—	9,618
Idaho	132,985	99,489	221,623	454,097
Illinois	25,182	63,792	—	88,974
Indiana	54,210	97,668	—	151,878
Iowa	11,570	14,111	—	25,681
Kentucky	93,843	199,023	—	292,866
Louisiana	276,556	858,660	7,499	1,142,715
Maine	209,656	537,475	—	747,131
Maryland	93,009	314,108	—	407,117
Massachusetts	106,625	283,915	—	390,540
Michigan	404,292	1,291,183	—	1,695,475
Minnesota	251,744	882,358	—	1,134,102
Mississippi	243,836	752,016	—	995,852
Missouri	191,118	478,392	—	669,510
Montana	71,496	36,637	120,250	228,383
Nevada	25,082	26,972	—	52,054
New Hampshire	64,951	110,389	16,964	192,304
New Jersey	98,898	250,432	—	349,330
New Mexico	6,730	6,780	—	13,510
New York	227,602	836,511	—	1,064,113
North Carolina	267,322	723,961	22,087	1,013,370
Ohio	54,469	214,651	—	269,120
Oklahoma	68,177	112,862	18,445	199,484
Oregon	661,079	1,148,979	1,561,967	3,372,025
Pennsylvania	197,000	455,209	—	652,209
Rhode Island	25,147	68,705	6,171	100,023
South Carolina	300,654	717,798	—	1,018,452
South Dakota	25,000	25,580	2,655	53,235
Tennessee	156,191	554,106	4,728	715,025
Texas	158,313	331,414	144,788	634,515
Utah	25,082	43,857	—	68,939
Vermont	25,147	43,414	7,414	75,975
Virginia	197,274	468,334	2,598	668,206
Washington	605,374	1,430,764	340,407	2,376,545
West Virginia	152,918	253,559	8,185	414,662
Wisconsin	308,798	871,227	—	1,180,025
Totals	8,960,230	23,740,283	2,902,877	35,603,390

Table 11. - DISTRIBUTION OF FOREST PLANTING STOCK
BY COOPERATING STATES. FISCAL YEAR 1952

(Clarke-McNary Law, June 7, 1924, as amended)

STATE	EXPENDITURES			
	Federal Funds	State Appropriated Funds	Receipts From Sale of Stock Used in Program	Total
	Dollars	Dollars	Dollars	Dollars
Alabama	9,880	180,302	22,383	212,565
Arizona	No program			
Arkansas	9,877	34,182	30,130	74,189
California	7,453	30,157	3,081	40,691
Colorado	2,403	2,403	11,980	16,786
Connecticut	7,350	12,586	14,789	34,725
Delaware	2,500	6,618	63	9,181
Florida	9,877	117,441	51,285	178,603
Georgia	9,877	196,111	67,545	273,533
Hawaii	9,973	26,283	All free	36,256
Idaho	10,800	18,170	8,913	37,883
Illinois	9,950	62,544	36,616	109,110
Indiana	9,950	73,153	88,478	171,581
Iowa	1,779	1,780	5,008	8,567
Kansas	No program			
Kentucky	9,940	31,748	7,137	48,825
Louisiana	9,877	123,567	51,954	185,398
Maine	6,784	6,784	6,265	19,833
Maryland	10,306	29,668	2,580	42,554
Massachusetts	9,940	30,411	6,024	46,375
Michigan	9,950	24,626	37,203	71,779
Minnesota	No program			
Mississippi	9,877	42,847	51,271	103,995
Missouri	9,950	33,951	7,106	51,007
Montana	9,800	18,730	13,716	42,246
Nebraska	-	-	40,437	40,437
Nevada	No program			
New Hampshire	9,940	14,364	4,043	28,347
New Jersey	9,940	23,451	10,185	43,576
New Mexico	No program			
New York	9,940	251,820	33,418	295,178
North Carolina	9,877	73,830	28,327	112,034
North Dakota	8,987	9,044	14,277	32,308
Ohio	9,950	75,759	49,039	134,748
Oklahoma	9,877	20,457	23,978	54,312
Oregon	9,800	16,275	13,837	39,912
Pennsylvania	10,290	148,091	114,524	272,905
Puerto Rico	9,800	13,563	All free	23,363
Rhode Island	2,500	3,377	-	5,877
South Carolina	9,877	39,920	31,231	81,028
South Dakota	3,643	3,643	49,429	56,715
Tennessee	9,877	33,228	16,005	59,110
Texas	9,877	10,801	32,066	52,744
Utah	3,552	3,552	4,067	11,171
Vermont	9,940	20,621	6,415	36,976
Virginia	9,940	21,578	28,409	59,927
Washington	8,106	8,106	7,289	23,501
West Virginia	9,940	13,217	30,304	53,461
Wisconsin	9,950	182,579	120,558	313,087
Wyoming	2,440	2,440	6,288	11,168
Totals	376,136	2,093,778	1,187,653	3,657,567

Table 12. - COOPERATIVE FOREST MANAGEMENT ACCOMPLISHMENTS
AND EXPENDITURES 1/. FISCAL YEAR 1952

STATE	ACCOMPLISHMENTS				EXPENDITURES		
	Farmers Assisted	Woodland Involved	Products Harvested	Gross Sale Value	Federal	State	Total
	Number	Acres	M bd. ft.	Dollars	Dollars	Dollars	Dollars
Alabama	851	161,584	33,351	1,099,157	21,957	21,957	43,914
Arkansas	142	20,691	879	23,480	6,084	6,084	12,168
California	530	86,702	36,985	288,625	8,685	22,772	31,457
Colorado	51	22,395	2,998	33,757	2,052	2,053	4,105
Connecticut	483	32,596	4,008	69,426	9,800	16,749	26,549
Delaware	82	3,230	1,153	25,660	2,500	3,221	5,721
Florida	1,003	490,701	24,121	458,763	19,500	36,757	56,257
Georgia	497	126,583	18,517	313,533	19,750	23,730	43,480
Illinois	663	19,740	3,062	107,484	24,149	24,976	49,125
Indiana	561	18,595	2,560	105,927	12,288	26,313	38,601
Iowa	384	14,883	2,849	73,056	7,456	16,482	23,938
Kentucky	537	50,976	4,398	98,133	16,500	17,691	34,191
Louisiana	248	21,954	2,800	72,234	14,868	24,583	39,451
Maine	1,022	33,093	6,548	126,756	18,000	18,247	36,247
Maryland	1,334	38,563	12,224	296,897	18,000	33,921	51,921
Massachusetts	335	12,795	3,072	42,846	5,450	6,282	11,732
Michigan	795	16,489	8,275	263,750	19,771	36,577	56,348
Minnesota	455	15,793	2,650	79,378	9,421	20,671	30,092
Mississippi	592	98,897	15,563	473,530	10,000	10,340	20,340
Missouri	1,167	149,103	11,192	287,719	26,812	46,455	73,267
New Hampshire	1,041	60,811	27,143	530,960	17,950	19,496	37,446
New Jersey	506	74,067	7,271	135,586	16,000	16,575	32,575
New York	2,597	154,365	31,926	643,135	21,300	104,868	126,168
North Carolina	963	97,889	24,748	594,204	24,500	40,027	64,527
North Dakota	84	5,482	1,280	76,810	2,850	3,399	6,249
Ohio	944	37,781	4,492	150,755	11,590	67,713	79,303
Oklahoma	373	1,680	284	14,495	4,250	4,689	8,939
Oregon	640	21,913	45,302	900,254	8,423	16,959	25,382
Rhode Island	14	986	3	10	2,338	2,338	4,676
South Carolina	880	121,068	19,378	666,692	15,318	34,809	50,127
Tennessee	621	37,688	10,157	275,708	14,500	19,322	33,822
Texas	753	95,814	3,231	50,616	11,718	18,191	29,909
Vermont	1,963	66,461	28,953	676,262	28,350	53,230	81,580
Virginia	1,767	178,096	168,271	3,902,961	30,000	70,937	100,937
Washington	984	40,139	24,965	533,670	11,301	14,045	25,346
West Virginia	926	34,770	3,403	76,124	20,459	43,701	64,160
Wisconsin	1,145	36,944	11,550	356,587	23,270	39,742	63,012
Total U. S.	27,933	2,501,317	609,562	13,924,940	537,160	985,902	1,523,062

U. S. Summary

F.Y. 1940)					4,793	8,284	13,077
F.Y. 1941) <u>2</u> /	165	49,416	2,667	31,483	15,342	17,120	32,462
F.Y. 1942	224	92,442	10,076	125,307	18,171	19,579	37,750
F.Y. 1943	3,242	359,388	75,600	1,043,878	101,076	111,559	212,635
F.Y. 1944	8,842	742,697	323,557	3,962,784	187,316	212,209	399,525
F.Y. 1945	8,093	831,347	411,330	4,476,354	199,995	230,865	430,860
F.Y. 1946	12,083	1,321,746	452,367	6,092,499	315,441	369,065	684,506
F.Y. 1947	13,531	1,576,888	502,312	7,805,105	344,720	449,626	794,346
F.Y. 1948	14,220	1,399,971	503,641	7,668,499	353,179	467,129	820,308
F.Y. 1949	17,140	1,769,240	437,903	7,721,865	349,117	573,882	922,999
F.Y. 1950	22,828	2,542,564	518,566	9,421,220	538,812	726,973	1,265,785
F.Y. 1951	25,352	2,558,091	721,938	15,941,940	548,608	886,250	1,434,858

1/ 252 Projects

2/ F.Y. 1940 and F.Y. 1941 Accomplishments Combined

Table 13. - FOREST FIRES ON PROTECTED STATE AND PRIVATE LANDS

NUMBER BY SIZE, AREA PROTECTED, AND AREA BURNED OVER

CALENDAR YEAR 1951

State	Number of Fires				Area Protected	Area Burned Over
	Under 0.25 Acre	0.25 - 10.0 Acres	Over 10 Acres	Total		
	Number	Number	Number	Number	M Acres	Acres
Alabama	214	4,644	5,570	10,428	18,112	375,388
Arizona	Data Incomplete					
Arkansas	514	2,446	1,724	4,684	12,405	90,951
California	1,142	869	428	2,439	19,500	137,851
Colorado	42	72	42	156	7,472	11,495
Connecticut	78	346	44	468	1,907	2,214
Delaware	17	54	12	83	440	544
Florida	329	4,851	5,012	10,192	12,774	443,374
Georgia	1,722	4,474	3,471	9,667	14,889	218,518
Hawaii	--	--	5	5	1,735	417
Idaho	279	123	86	488	6,963	14,162
Illinois	39	113	115	267	3,755	9,088
Indiana	55	193	98	346	4,255	5,017
Iowa	--	3	7	10	1,968	278
Kentucky	6	373	390	769	5,067	13,565
Louisiana	135	4,198	3,908	8,241	9,564	314,085
Maine	116	247	59	422	16,692	3,704
Maryland	69	305	44	418	2,686	2,325
Massachusetts	406	667	66	1,139	3,293	9,971
Michigan	160	497	88	745	17,124	4,849
Minnesota	159	261	175	595	17,996	26,272
Mississippi	381	7,555	5,491	13,427	10,711	258,260
Missouri	161	1,368	1,414	2,943	6,984	155,860
Montana	178	50	10	238	6,000	549
Nebraska	Data Incomplete					
Nevada	32	19	16	67	2,150	5,884
New Hampshire	129	126	18	273	4,176	2,675
New Jersey	409	641	98	1,148	2,294	15,007
New Mexico	68	21	8	97	1,105	9,962
New York	194	818	224	1,236	13,423	11,937
North Carolina	145	1,420	1,840	3,405	15,424	186,557
North Dakota	Data Incomplete					
Ohio	108	387	120	615	4,973	5,690
Oklahoma	45	484	416	945	3,572	82,508
Oregon	586	369	193	1,148	11,995	112,273
Pennsylvania	49	504	297	850	14,659	33,742
Rhode Island	32	200	30	262	452	10,778
South Carolina	452	3,940	2,333	6,725	11,300	150,688
South Dakota	17	57	13	87	896	476
Tennessee	101	1,892	918	2,911	7,200	43,942
Texas	147	1,123	1,732	3,002	8,265	184,869
Utah	18	67	30	115	5,721	2,360
Vermont	32	72	11	115	3,504	808
Virginia	347	1,274	334	1,955	12,971	15,980
Washington	1,365	764	137	2,266	12,329	50,172
West Virginia	66	793	487	1,346	9,038	28,403
Wisconsin	200	255	37	492	15,590	2,057
Wyoming	Data Incomplete				85	
Totals	10,744	48,935	37,551	97,230	363,414	3,055,505

Table 14.-STATEMENT OF EXPENDITURES FROM APPROPRIATIONS AND ALLOCATIONS TO THE FOREST SERVICE

FISCAL YEAR 1952

(Classified by Primary Purpose of Appropriation)

National Forests:

Operation and Protection:

National Forest Protection and Management	\$28,725,294
Fighting Forest Fires	8,569,554
Blister Rust Control	1,691,585
Forest Pest Control	1,706,694
Cooperative Range Improvements	372,471
Smoke Jumper Facilities	<u>3,828</u>

\$41,069,426

Forest Roads and Trails:

Forest Development, Roads and Trails	13,979,812
Forest Highways (Commerce Dept.) (F.S. Administration).	86,943
10% Fund for States	<u>3,952,536</u>

18,019,291

Acquisition of Land

147,031

Total, National Forests

\$59,235,748

Research:

Forest Research	5,396,169
Research and Marketing Act	<u>23,474</u>

Total, Research

5,419,643

State and Private Forest Land Items:

State and Private Forestry Cooperation

10,675,182

Flood Control:

Preliminary Examinations and Surveys	650,411
Works of Improvement	<u>763,254</u>

Total, Flood Control

1,413,665

Services Performed for and Financed by Other Federal Agencies:

Production and Marketing Administration (Agriculture)	127,984
Department of Interior	110,925
Department of the Navy	208,254
Department of the Army	1,034,752
Department of Commerce	168,519
Defense Production	78,407
Farmers Home Administration	13,974
Department of Defense	32,405
Miscellaneous	<u>82,786</u>

Total, Services for and Financed by
Other Federal Agencies

1,858,006

Cooperative Work Financed by States, Counties, Organizations,
and Individuals. Includes fire control on intermingled
private land, construction and maintenance of improvements,
investigative work, slash disposal, etc.:

Cooperation Work Fund

6,697,054

Expenses, Brush Disposal

451,829

Total, Net Expenditures

85,751,127

Expenditures from Proceeds of Sale of Parts and Equipment

383,584

Additional expenditures for which the appropriations were
reimbursed:

Forest Service Units and Other Government Agencies	5,027,304
Non-Federal Agencies	<u>219,931</u>

Total, Appropriation Reimbursements

5,247,235

Grand Total

\$91,381,946

